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# STONE

DEVOTED TO THE QUARRYING AND CUTTING  
OF STONE FOR ARCHITECTURAL USES

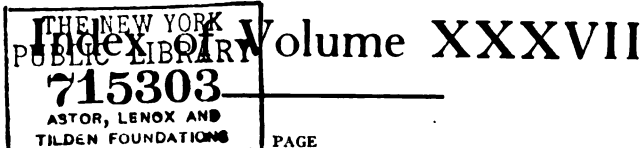
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## The Building Outlook

**I**T is the general custom at the close of a year to review the conditions in various fields of activity that have obtained during the preceding twelve months, and to draw from these an indication of the prospects for the coming year. By glancing through the technical papers and the reports of commercial bodies one is enabled to gain a consensus of the views of the leading experts in different lines. Building is one of the very first industries to feel the effect of business depression, and one of the last to recover. When the great European conflict broke out, industries were everywhere interrupted and financial conditions upset. Building in this country, as well as abroad, was hard hit. It is apparent to the most casual observer that we have, in a measure, adapted ourselves to the new conditions confronting us, and that our foreign commerce has grown to unprecedented dimensions. As the stone trade is entirely dependent upon building activity, it is very important that we should understand whether the present business situation is due only to the temporary stimulation of war orders, or may be considered fairly stable. If the latter is the case, we may look confidently for a boom in building in the near future that will last for several years, at the least.

The Chamber of Commerce of the United States of America has issued a special bulletin on "General Crop and Business Conditions," under date of December 31, 1915. This is prepared by the committee on statistics and standards, which has a membership representing the entire country. It is impossible to follow this in detail, but it is extremely optimistic as to the outlook for the coming year. The bulletin opens with the statement that "the adverse effect of the conflict in Europe still prevails in some sections though to very much less extent than at this time last year. There are still scattered fears of the possibility of this country being involved in the gigantic strife; but as against this the large portion of the people are paying less and less attention to the war and more and more are concentrating their thoughts and efforts on domestic matters. Beyond this, is the striking fact that the influence of the war at present as a whole is more favorable than adverse, because of the tremendous impetus it has

given to certain lines of manufacturing, especially east of the Alleghenies, and likewise to many agricultural products."

The committee also declares that "the crop yields in general, other than cotton, exceed those of any year known to our history. This is true in especial of the small grains as a whole, and is particularly true of all the forage crops which are in abundance beyond precedent. This latter fact is one that is most significant and of very large moment to the country as a whole. It is of the utmost value and importance to the farmer to have cheap and abundant feed for his livestock through the coming winter, and this state of affairs at present exists as one of the stable foundations for that commercial prosperity which seems definitely to have arrived." While the cotton crop is conceded to be the smallest in several years, the committee says that it is being sold at very remunerative prices.

Finally, the committee says: "The lumber business which seemed dead for several years appears only to have been sleeping. It is improving slowly throughout the entire country, but especially in the yellow-pine district of the South. This is due to increased orders for exports and to buying by railroads and car companies. It is expected that during the Spring there will set in buying for homes, and a general revival of building throughout the country especially outside of the large cities is looked for during the first six months of the coming year. Of all the so-called barometers of business there are none so truly indicative of general prosperity as building. It is usually the last industry to feel the impulse of better times, but its activities embrace so many lines of business that this effect is general throughout the country."

Aside from the crops, the general prosperity of the country also depends upon the active development of our mineral resources. Here the conditions seem to be equally favorable. A memorandum sent out by the United States Geological Survey gives an estimate of mineral production for 1915. A review of these statements confirms Secretary Lane's comment of last July to the effect that the mining revival is in full swing. In the Western States alone the metal produc-

tion shows an increase in value of more than \$130,000,000 over the corresponding figures for 1914; and the year's increase in output for the principal metals measured in value is more than \$250,000,000. Moreover it is not unreasonable to expect that when the full returns for all mineral products are compiled they will show that 1915 was the country's most productive year in the mining industry. The total may even reach two and one-half billion dollars.

The copper mines passed all records for previous years, the 1915 output having a value of \$236,000,000, or \$83,000,000 more than the value of the production in 1914. Iron ore had an increase of more than 38 per cent over the previous year. The output of zinc had an increase of nearly 25 per cent. in quantity, and refined pig lead showed a gain of 20 per cent. in value, while antimonial lead increased 23 per cent. in quantity. Gold, silver and quicksilver also made large gains.

A bulletin by the New York Department of Labor gives a review of the labor market for the month of November. From this are taken the following facts:

"The *stone, clay and glass* group, although reporting a substantial increase in November of this year, as compared with November, 1914, lost ground as compared with the preceding month. This decrease was not so great, however, as that reported from October to November in 1914. As compared with November, 1914, each industry except lime, cement and plaster mills reported marked improvement.

"The building trades, in which labor organization is of long standing and is more nearly complete than in any other industry in the state, report, through returns from 59 representative unions with 31,000 members, the same percentage of idleness in November as in October. Ordinarily, unemployment in the building trades increases from October to November. The percentage of unemployed members was about one-half as large as in November, 1914, and, while greater than for the same month in 1912, was less than in 1913 or in 1911.

"The returns from first and second class cities as to the estimated cost of building work (including new buildings, alterations and repairs) for which permits were issued in November indicate a marked improvement as compared with the previous month and an enormous improvement (141.5 per cent.) as compared with November, 1914."

No one can read the facts set forth above without a well-grounded belief that this country is now at the beginning of a period of prosperity and general business activity that is likely to surpass anything in our entire history. Building is already beginning to pick up. Plans are being prepared for important public, business and private buildings, and estimates are asked for expensive and elaborate structures in all parts of the country. The quarries and cutting plants will neglect their opportunities if they do not prepare for

such a demand for their products as they have not had for several years past.

In a general review of the building situation, Mr. Louis J. Horowitz, president of the Thompson-Starrett Company, says:

"Unmistakable signs at least of a partial recovery in the building business from an extended period of stagnation and depression, which set in well before the beginning of the European war, and was aggravated by the breaking out of the war, are now plainly visible.

"This convalescence is noticeable chiefly in the Middle West, notably in Cleveland, Detroit, Minneapolis, etc. It will take New York City a little longer, however, to respond to this renewed activity, because when the present period of depression was first felt here in the building industry the supply of space greatly exceeded the demand. Thus, what was but a normal reaction in other areas assumed abnormal shape in this city, complicating an already aggravated condition, like pneumonia following a cold.

"To sum up, the lean years from which I believe the building industry is now about to emerge, were a normal reaction, aggravated first by the political activities and subsequently by business fears engendered by the cataclysm in Europe, and in the case of New York further complicated by over-production; but the change for the better now imminent will, in my opinion, be more than the periodic change, more than the customary resumption of activity following depression."

### Vermont Seal in Granite

There has just been executed in the sheds of Novelli & Calcagni, at Barre, for the E. L. Smith Company of that place, a carved representation in granite of the seal of Vermont. This is intended for exhibition purposes, and was carved by Ernesto Malnati. The carving is on a slab of granite measuring three feet six inches by two feet ten inches, and every detail of the seal has been reproduced with the utmost faithfulness.

### Large Award for Quarry Property

Last June Supreme Court Justice Morschauer appointed former Chief Justice Edgar M. Cullen, chairman; Walter G. Hamilton, of Rockland, and Frank L. Young, of Ossining, a commission to take evidence and fix the amount to be paid for the property of the Rockland Lake Trap Rock Company, which is to be a part of the Palisades Park system. The commission has held many meetings and has heard testimony from engineers and experts. It completed its labors on November 29, and fixed the value of the quarry property at \$2,325,000, with an additional allowance of \$75,000 for locomotives, steam shovels, etc. It is announced that the quarry company, of which Wilson P. Foss holds the controlling interest, claims that the value of the property exceeds \$5,000,000, and will take an appeal from the award.

## The Largest Stone Ever Quarried

**T**HERE magnitude alone makes appeal to mankind. Almost every one is interested in the greatest things of their kind, no matter what they may be. In every age there has been the effort to surpass previous achievements. The Egyptians as a nation are chiefly notable for their grandiose work, and the result is that the pyramids, the Sphinx, and various giant obelisks and monster temples stand as their principle monuments. The Egyptians worked in stone, as does every nation that wishes to leave imperishable records of their civilization. The natural tendency of this people was helped by the fact that close at hand were inexhaustible deposits of high-grade stones, limestones, sandstones, quartzites, granites, syenites, basalts and porphyries. The manner in which the Egyptians quarried these stones in huge monolithic masses, transported them for immense distances, and erected them into stately piles of masonry, is one of the marvels of history. Some of their work was of almost inconceivable magnitude. The two Colossi of Memnon at Thebes are carved of a pebbly and quartzoze sandstone conglomerate of a yellowish brown color and very difficult to work. The height of the statues alone is 52 feet, and of the pedestals 13 feet. They represent Amenophis III, who erected them in 1427-1392 B. C. The northern one was the famous vocal statue

of Memnon, which was reputed to give out a song as the rays of the morning sun smote it.

One striking manner in which Egyptian art manifested itself was in the erection of obelisks, or carved monolithic shafts of stone. One of these is the famous Cleopatra's Needle in Central Park, New York. This is of granite, 57 feet in height, and its transportation from Egypt and erection in New York were considered quite a triumph of modern engineering. And yet this is but a moderate example of this style of work. In front of the Lateran Palace, in Rome, there is a monster shaft of red granite, no less than 105 feet high and weighing 430 tons. This was originally erected by King Tutnes III (B. C. 1597-60) at Thebes, and was removed to Rome by Constantius, 357 A. D. It was overthrown and broken into three pieces before it was erected on its present site by Sixtus V in 1587. The next largest obelisk is at the ancient Heliopolis near Cairo, which measures 97½ feet in height and 8½ feet square at the base. This is of rose granite from Assuan and was erected by Queen Makere about 1500 B. C. An inscription records that it was made in seven months, surely a remarkably short time for so great an achievement in quarrying, stone-cutting and engineering.

Inquiries have frequently been made of this maga-

### THE GREATEST OF QUARRIED STONES

A monster block intended for the Temple of the Sun Baalbec, Syria. This weighs about 1,500 tons. The ruins of the Temple are seen in the middle distance.

zine as to what was the largest stone ever quarried. If linear dimensions alone are taken into account, the Lateran obelisk undoubtedly holds the record, but as to

state of preservation. It is made up entirely of enormous blocks of stone laid up in dry masonry with close fitting joints. The base courses of this temple are of blocks ranging from 20 to more than 60 feet in length. These are all surpassed, however, by a block which was cut from the ledge, squared up and partly removed from the quarry about half a mile from the temple itself, but left there when the work was finally suspended. An illustration of this block, just as it lies at the present time, is given herewith. An idea of its size can be gained from the accompanying figures, but the exact statistics make the work of the ancient artisans even more remarkable. This block has the almost incredible dimensions of 75 feet, by 18 feet, by 15 feet, and weighs fully 1,500 tons. It should be stated that the stone is a soft and free working nummulite limestone, but this does not detract from the credit due to the workmen who could break it loose from its bed and dress it into shape with the crude tools then available.

In recording the largest blocks quarried, the reference is, of course, to those that have been not alone broken from their beds, but have also been removed from the pit, dressed and erected. With modern explosives, drills, and quarrying apparatus, it is no unusual thing for a mass of rock weighing many thousands of tons to be broken loose and overthrown, but these great blocks are cut into smaller pieces before being removed and worked. About the year 1875, the proprietor of the Prentice brownstone quarries, in Michigan, quarried a single shaft of stone slightly over 100 feet in length. It was intended to use this as a display at the Centennial Exposition in Philadelphia. It was found, however, that it would be impossible not only to remove this from the pit, but also to transport it to Philadelphia. It was, therefore, broken up into smaller sizes for commercial use. No one would be bold enough to declare that modern ingenuity would find it impossible to equal the gigantic blocks that find a place in the Temple at Baalbec, but they are likely to stand for all time as the record in stone quarrying.

### Oregon Sandstone Needs Development

The Employers' Association of Portland, Ore., appealed to H. M. Parks, director of the Oregon Bureau of Mines and Geology, as to whether, in his opinion, Oregon sandstone was available for use in the new Portland postoffice. Mr. Parks replied that plenty of suitable stone exists in the state, but that its development has been slow. Whether or not any of this stone is to be found in sufficient quantity in those quarries already developed to make its use possible in the postoffice Mr. Parks said he was unable to answer.

Concerning two instances of available building stone, Mr. Parks says:

"These examples illustrate to you the point which I believe has a greater retarding effect in the development of our stone industry than any one other factor. The quarryman says: 'I do not want to develop my

### AN ARTISTIC CHURCH SCULPTURE

Erected on the altar of Notre Dame Church, One Hundred and Fourteenth Street and Morningside Drive, New York. Architects, Cross & Cross. Carved by Ardolino Bros., from a block of South Dover Marble from the quarries of the South Dover Marble Company, Wingdale, N. Y.

mass and general magnitude, nothing in the way of quarried stones will compare with those that were used in the temple of the sun at Baalbec in Syria. The remains of this wonderful structure still stand in a fair

quarry until I am sure of a contract.' On the other hand, the Government officials say: 'We will consider no stone that is not developed sufficiently to prove that a sufficient amount of high-grade stone is available.'"

In other parts of his letter, Mr. Parks says:

"I have had a great deal to do with the campaign of investigation of Oregon's building stones and I would like to suggest to you a problem which may not have occurred to you in this connection.

"We have recently been able to induce the department at Washington, D. C., to use the Pioneer sandstone from Lincoln County in the Medford postoffice. Before that was done, however, I received instructions from the supervising architect at Washington to examine the proposed quarry in Lincoln County and report to him whether or not there was sufficient stone in sight, of the quality represented by the sample tested in Washington, to complete the Medford postoffice. This I promptly did and reported by wire that there was sufficient stone available for this job. It is doubtful, however, if I could have made a favorable report if it had concerned a very much larger building or a number of buildings because of the limited amount of development work which was done at the quarry.

"Let me cite another instance. There is a stone which outcrops in large quantity in Linn County, some four or five miles south of Brownsville, which has been tested by the Oregon Bureau of Mines and Geology and also by the department at Washington, where we were particular to have the qualities of this stone tested. The tests prove it probably the best sandstone of which we have any knowledge in the state. However, there has been practically no development work done on the outcrop. It is held by one of two stone firms in Portland and has been now for nearly two years with comparatively little development work.

"I would like to be in a position to enthusiastically recommend this Brownsville stone. It would probably be foolhardy for me to do so, however, until the development of the quarry has gone on to such an extent that I can answer the question which will be put to me: 'Is

there sufficient stone available for the Portland postoffice?'

"It will be evident to you that I could not definitely answer this question in the present state of the development of the property.

"These two stones, namely, the Pioneer in Lincoln County, and the Brownsville stone in Linn County, the latter not having been used except in a very limited way some years ago, seem to give the best promise of being accepted by the department at Washington, on account of their pleasing colors. We have numerous sandstones in the state which meet all other qualifications but light, pleasing, colored sandstones are extremely rare west of the Cascades."

Outcroppings of sandstone of beautiful color and excellent texture are found in many counties of the state, especially in eastern Oregon. Harney County has several, and some of the buildings at Burns are built of it. Most of these croppings, however, are so far from rail transportation as to be without much value, except for the limited uses in the immediate localities.

### A Word for the Tombstone

Now that the fresh vision of a new generation is discovering charm and beauty in so many relics of former days which have long been unhonored, one

### A BEAUTIFUL MARBLE INTERIOR

Residence of Mr. C. K. G. Billings, at Oyster Bay, New York. Architect, Guy Lowell.  
Marble work by Geo. Brown & Co., New York. The bowl of the fountain is  
Siena marble and the pedestal and trim of the room of Botticino marble

wonders how long it will be before the quaint old tombstones of our fathers obtain again the appreciation they deserve.

Here and there, throughout our Capitol district countryside, little groups of them appear, says a writer in the *Albany Press*. Scores of churchyards are filled with them, many dating far back in the eighteenth century, and some still older. On hundreds of farms are tiny plots, with a dozen or more of the flat white slabs of marble which mark the private burying ground of a family of other days. Brambles and the wild rose protect them from intrusion, and gay blossoms make them lovely through half the year.

Ignored, in many cases, far too long, the chief atten-

tion these stalwart reminders of worthy lives have had has been on occasional visit of a curious stranger, often to smile at some odd stroke of epitaphy, some humble verse or some queer touch of sculpture that to the unthinking seems grotesque. Now, as culture widens and perspective grows, we are beginning to detect in their classic simplicities a depth of artistic merit that rebukes our self-satisfied blindness.

We are willing to admit that in some other fields the Victorian period was full of blunders. Artistically, it was in many respects an era of retrogression, of regard for polish and embellishment and intricacy, at the expense of dignity and soundness of design. The old tombstones do not offend us in these respects.

## Advertising on Tombstones



CASE has just been tried in the courts of Carlisle, England, that has an interest to the stone trade in this country. Church officials sought to authorize the removal of the name of a marble worker from a headstone, recently erected in Gilsland Churchyard, or, in the alternative to remove the headstone from the churchyard. The stone as erected contained, in addition to the inscription, the name and address in large letters of the maker, although no application had been made by the tombstone man of the Vicar for permission to use the name. The Vicar and the churchwardens looked upon it simply as a glaring advertisement. Requests had been made of the marble man to remove the words, but he had not done so. Other tombstones had the names of the sculptors in very small letters, whereas in this case the name ran across the front of the base in very large black letters cut into the stone, and nobody could read the inscription without being compelled to read his name.

The counsel for the marble man declared that his client had been putting his name on tombstones for many years and so had many other people and it would be difficult to go into any other churchyard in England without finding the sculptor's name on tombstones or the surrounding curbstone. A workman who took an interest in his work had a reputation to keep up and was proud to have his name on his work. An artist generally puts his name at the foot of his work as a guarantee of its character. This was not an advertisement to which strong objection could be taken, and the lawyer asked the court on behalf of his client to say either that the inscription should remain or be put in a less prominent part of the tombstone.

The Court finally ruled that this was a case of audacious and offensive advertisement. This was a great age for advertising, the Court said. A very proper place for an advertisement was the newspaper press. Sometimes advertisers used the walls of their cities, and it would be as well if the police sometimes

interfered with these advertisements. Some advertisers use huge boards on the borders of the railways in order to add to the amenities of the landscape, but their country churchyards would long be protected from all such attempts at advertising. At times the insertion of the name might be almost invisible and might not be so gross as in this case, but this showed to what opinion might grow. Therefore the Court had no hesitation, not only because this had been done without the consent of the church officials and that no notice had been taken of their remonstrances, but also because it was in itself offensive and seriously open to objection. The judgment of the Court was that the petition of the church officials should be granted in this form; that the tombstone with the base be altogether removed from the churchyard within a fortnight of the present date. If this was not done, power was given to the church people to remove the tombstone and its base from the churchyard.

It has generally been supposed that the Americans are the boldest advertisers to be found, but it is safe to say that they generally spare the churchyards and cemeteries from their announcements. It is possible that a name may occasionally be put on a tombstone in this country, but if it is, it is in such small letters and in such an inconspicuous place that it cannot be seen on casual inspection. We have never known of an instance where the name of a sculptor or marble man was as conspicuous as the inscription itself, which seems to have been the case in the English controversy. Even in the case of a notable statue, the name of the sculptor is very modestly displayed. There is, perhaps, a growing disposition to place the name of an architect on a monumental building that he may design, and there is much to justify this practice, but the name is never prominently displayed. Whatever may be done along this line in the way of justifiable publicity, general opinion in this country will uphold the decision of the English court that cemeteries should be free from any obtrusive advertisements.

# Stone and Policies of Business Conduct

By R. M. RICHTER



**FREQUENT** mistake in the organization of quarry companies has been the disposal of stock or other securities among a large number of investors and in small lots to each. It usually precludes the possibility of future financial support, especially where, as is ordinarily the case, subscribers expect almost immediate returns on their investment. So far as the development of new quarries is concerned, and, for that matter, too, the policy in operating established ones, the effect of current efforts on conditions one year, three years, ten years after, should be the governing issue. The common error of simply following the line of least resistance is costly beyond computation and indicative of either incapable management or cramped financial conditions, and often both. In any event, the latter state is certain to follow the former. Lack of foresight on behalf of management and investor is sure to exhaust the most replete exchequer in a little while.

Really successful quarrying concerns have established their standing through years of intelligent and

consistent endeavors. Such whose career in any sense resembles the meteoric are virtually unknown. For progress is slow at best and who enters this laborious field must be prepared for more or less of a siege before the goal of dividends is attained. Hence arises the argument that at least during the early stages of growth the small investor is an undesirable element. For he soon becomes restless and then impatient because his perhaps trifling, though to him, vital share in the undertaking lies dormant while equipment is created, land stripped, outcropping and inferior ledges are removed, and, last, but not least, markets are opened. Where it is sought to appease his appetite for quick returns by forcing rapid production of merchantable stock, his principal is likely soon to be placed in jeopardy by inevitable detrimental results from thus casting aside the dictates of sound judgment in operations. There is no surer method of effectively blocking the way for permanently profitable future development.

Unless, therefore, the small investor is content to

## GEORGIA MARBLE IN THE UTAH STATE CAPITOL

Main stairway from Rotunda in the new Capitol at Salt Lake City. Built of marble from the quarries of the Georgia Marble Co., Tate, Ga. Contractors, The Blue Ridge Marble Co., Nelson, Ga.



exercise patience and abide his faith in the judgment of practical management and the economic laws of the industry, his funds had best be placed elsewhere.

It is not alone the preliminary, unproductive period of quarry development which makes the small stockholder undesirable, but equally so the experience in many instances that capital beyond that originally contemplated is needed to develop a property intelligently and harmonize its various elements. Not often is less or just about so much money required as was originally provided. Then comes the pinch unless wisdom governed in the inception and the undertaking has backing which will give it further support, physical conditions being right. Clearly that organization carries the promise of success whose active management is competent, while its monied interests will stand behind the project ready to support it for the best of the whole.

The question of detailed financial organization naturally varies widely under varying circumstances. What character securities shall stand as receipt for the investment, title to principal and return on same is largely a matter of expediency in each individual case. But it may be stated as fairly conclusive that bond issues are objectionable, as is cumulative preferred stock with provision for compulsory retirement. In effect, stock issued by a quarry, as of any commercial venture whose period of productivity is limited, represents simply funds advanced, returnable to the investor with interest within a fairly definite period. But in the case of capital stock as commonly based, the repayment is largely at the convenience of the corporation. Once established, the rate of refund should, as a matter of course, be maintained in reasonably steady volume. It must be borne in mind that the stone trade is peculiarly susceptible to violent fluctuations in the general commercial situation. Consequently any financial scheme which imposes a constant and rigid obligation to pay for the use of capital embraces strong possibilities of distress, perhaps disaster, when the ebb of commerce is low or local conditions at individual properties enforce an unremunerative era.

Nevertheless this one important point, namely, financial return to the holder of straight stock, involves by inference at least all the factors of other classes of securities requiring fixed dividends or interest and sinking fund operations. The compensation to the stockholder in a corporation whose properties will be exhausted in a measurable time must cover two requisites, amortization of principal and current interest. This, though in the case of straight stock, the interest be termed dividend. If such a corporation and its shareholders do not consider a percentage of dividends as return of capital, it should, if it desires to pursue a business-like policy, set aside a tangible reserve with which to properly liquidate when physical resources have been exhausted in fact or through obsolescence. So that in the case of, say, ten per cent. dividends, such dividend in effect is to be assumed to

include four per cent. amortization where the life of the property is estimated at twenty-five years. Hence, in effect, such a ten per cent. dividend amounts to only six per cent. net as payment for use of capital. Naturally the ratio of dividend will increase and that of capital return decrease with each disbursement, provided such payments are maintained with a fair degree of regularity.

A line of action and application of principle as just set down may well be considered a moral obligation. On the other hand, the legal obligation engendered through bond issues forces a financial policy which has proven detrimental in more ways than one. It imposes the inflexible liability of meeting interest and sinking fund requirements regardless of the local or general situation. In periods of poor business it demands its toll despite resultant sacrifices. Such sacrifices may mean curtailment of operations at critical times when development of markets and extension of operations with an eye to the years to come are a vital necessity. Or they may mean conversion of material into money, regardless of the value of the product, in order to satisfy imperative conditions; in any of which events future possibilities are mortgaged entirely out of proportion to the real exigencies of the occasion. The activities of the enterprise are crippled and its markets demoralized through sales made at any figure in order to materialize funds. Thus the price paid for existence is made a throttle for the present and a curse in years to come.

As to the quarrying division of the industry, as distinguished from the mill dependent on outside sources for its raw material, a great misfortune of the former is probably the very fact that it does control the raw material. The inherent value of the product is quite generally overlooked and revenue considered ample if it comfortably covers actual expenditures. Assuredly the inherent value of stone is great, measured not alone by the cost of the land containing it, but even more so on the principle of conservation. That is, stone once used can never be replaced. Again, mills which control no raw material but are compelled to purchase it are inclined to disregard deterioration and obsolescence of equipment as an all-important element of cost. Idle plants and rusting machines everywhere are mute examples of that regrettable fact. One is inclined to speculate how many stone enterprises of every description exist today which could successfully weather a sudden revolutionary change in methods of production and fabrication.

It is a question whether reverses in the industry are cause or effect of unbusiness-like administration. But close analysis would seem to indicate that lack of modern approved methods has spelled ruin for many. In spite of all, however, stone will always be used in building construction and competent management on practical, up-to-date lines sufficiently and intelligently supported as to finances must bring success.

Stone is compelled to court favor with the public. It cannot be forced on it. Furthermore, stone is one of Nature's complete products and its handling at every stage entails large, unavoidable losses. Hard and fast rules of production, sale and use are impossible. There are more intricate elements and important little things in the industry than can be outlined with any degree of intelligence. As an inevitable consequence liberality and broadmindedness of management are pre-requisite to desirable results. Lasting success is attained chiefly by practices which recognize that condition. Liberality does not imply sacrifice of standards of precision. Present day business standards demand liberality in policy. This breeds loyalty in organization and goodwill outside, two factors which never thrive singly, but jointly always do.

The sales policy should be fair. Secret rebates are declared criminal in railroading; they are at least morally untenable in general business. As a matter of fact, recent congressional action extends legal prohibition in that direction as well. Certainly secret rebates create unfair competition. Reduced prices based on quantity purchases are justifiable, but to sell one party a thousand dollars' worth of goods at par and the same value to his neighbor for nine hundred dollars is indefensible. Discounts are rightly used to adjust varying conditions of credit, but pure and simple favoritism causes a distinctly unhealthy state of affairs. Aside of the resultant limitation of the full-price customer's opportunity to profit, favoritism undermines the entire price structure. Absurdly low market values originate just there. Grade of material and credit risk being equal, the only consistent policy is that of one standard charge.

Wholesale as against retail principle in effecting sales has become a hotly debated problem. On the one side is the producing quarry, which deals with the ultimate consumer, through the general contractor direct; on the other, the mill which buys of quarries and acts as middleman. Endless arguments are offered pro and con as to which of these two is the method conducive to proper, lasting beneficial results so far as the industry as a whole is concerned. It is contended that scientific development requires all raw material be fabricated at the source, eliminating waste

where its disposal is effected at least cost, holding general operative expense down to the minimum and thus cheapening its cost to the purchaser. The idea of retaining for increased profits a portion of savings so effected unfortunately is rarely followed. The real consumer, namely, the owner for whom a building is erected, in only isolated instances gains from so-called scientifically reduced cost. Quite usually the general contractor is the chief, if not sole, beneficiary, and in such event theoretically tenable maxims are utterly defeated in practice.

Finishing at the source unquestionably eliminates waste. Freight is not required on superfluous material and quarries are enabled to utilize product which the cutstone contractor elsewhere probably would not buy except at material concessions; though when he does, he only too frequently harms his reputation if he lays claim to doing first-class work.

Dressed beef pays railroad rates approximating 160 per cent. of those applying on cattle on the hoof. It is similar with furniture and lumber, terra cotta and clay, glass and glass sand, sugar and sugar beets. In a number of districts differentials in favor of rough, unfinished stone as against complete ready-to-set product are already in effect. As the railroads progress at the late direction of the Interstate Commerce Commission in their effort to place tariffs on a scientific basis they will in season unquestionably apply universally the rule of charging greater value less-bulk-and-weight

HOUSE OF REPRESENTATIVES, UTAH STATE CAPITOL

Finished in Utah Birds-eye Marble from the quarries of the Mt. Nebo Marble Co., at Thistle, Utah. Architects, Richard Kletting, Salt Lake City, Utah

stone a higher rate per hundred pounds than is assessed against raw stock, low-priced, bulky and heavy.

In cutting at the quarries stone ready for setting the operative expense without question is reduced by a substantial margin and for sundry reasons. But at the same time the overhead expense is relatively at least vastly increased. Every sale is an individual transaction. Every contract requires separate more or less costly effort and staple markets are practically an unknown quantity except by most general interpretation. The good will of building contractors is rarely sufficiently strong to allow their buying except on strictly a competitive basis. And it is the building contractor to whom the finishing mill must look for its customers.

Scattered examples of successful operation of finishing mills at the source of production cannot controvert the broad statement that the activities of all of them as a whole have shown neither enduring profit nor have they helped the stone trade as such. Mills of that character no doubt occupy a legitimate field and in a degree are essential to the general welfare, particularly where they are of a size to assure proper service in exceptionally large contracts requiring stone. But when quarries of inconsequential capacity enter the cutstone field and no-quarry mills spring up in producing districts with the avowed object of feeding on the leavings which the established trade the country over cannot risk using, the results are disconcerting and in many districts have proven directly harmful.

It is a fact that a large percentage of buyers of any commodity think less of it if it is offered at an unnecessarily low price. Suspicion is aroused. Cheapness as main sales argument is no indication of intelligent salesmanship. Unreasonably low cost to the purchaser belittles the standing of any article and often causes irreparable loss of prestige. When finishing mills at the source of production operate so as to retain for themselves and the capital invested in them what benefits accrue from favored location, criticism might well hesitate. But the increased margin, as already stated, is customarily donated to the general contractor and the absolute net result is reflected in acute antagonism of independent cutstone operators in all sections.

Reference was had above to the fact that control of raw material by finishing mills in the stone trade may well be considered a misfortune. It is that also in so far as such mills, whether located at the sources of marble, sandstone or limestone, are in most cases tempted to and do quarry and finish their output at a single profit, if any, for both operations. Either the quarry is placed on a remunerative basis and the mill used simply as a sales instrument, a source of expense and no profit, or the mill is operated on an apparently paying line of contracts where the quarry is made to contribute the raw material on basis of bare compensation for actual money expended. The

result in either case is single profit on double investment, demoralization of trade conditions generally and hastening of the inevitable day of reckoning for failure to observe fundamental economic principles.

The production of raw material in the stone business is an operation entirely separate and distinct from finishing the product ready for setting. Each requires its individual lay-out of facilities and the former is governed by the seasons except in the South. Strictly individualized organization is required in both branches of the industry while the sales efforts are as different one from the other as can be. Unified physical control of both has rarely been accomplished with permanent success. Exceptions only prove the rule. Unified financial control may be feasible but it is fully justified only in those instances where peculiar local conditions and characteristic limitations of product do not make it readily possible to find markets except for the particular stone in the finished state.

Specifications for marble rarely are confined to one quarry company's offerings unless that company controls a sufficient variety to make possible complex decorative schemes. Therefore the average marble quarry controlling one or only a few grades and markings which succeeds in creating demand for what it has is often compelled to buy elsewhere other requirements of the same contract when it produces and finishes work complete. In the absence of so-called working arrangements and they are usually absent, little satisfaction and less profit follows in the wake of such outside purchases. Ordinarily they are purely and simply a drain on the buying concern's own productiveness, a costly requirement and nothing more than an adjunct to its sales expense. They involve the use of increased working capital in order to achieve results which, under a different policy, would be more satisfactory and profitable though on the same level as to dollars and cents. This because increased effort and funds are needed with additional charge for capital used without, in fact, reaching beyond the desired return on reasonable investment called for otherwise.

Quarry-cutstone plants handling exterior products are confined to competition on contracts which call for such stone as their operations happen to cover. Fashions change in stone as in everything else. Evolution along those lines is only too often accelerated by theoretically scientific but practically unwholesome activities of finishing mills at the source of supply. Inferior products are forced on the market and architects become dissatisfied. Errors and damage in transit occur involving costly and annoying loss of time to correct by replacement or otherwise and general contractors grow disgruntled. Absurdly low prices are quoted and the local cut stone contractors rise up in arms.

There being no steady markets for stone offered cut ready to set at the quarry the inclination is to slight

the work by every conceivable means. Each new prospect involves a fresh sales campaign. Therefore good will is a negligible element in most instances. The one aim predominates of completing the commitment immediately at hand and having it over with regardless of the remoter consequences, letting the next following proposition take care of itself. Here today and there tomorrow, depending on the general contractors' gullibility and hankering for just cheap prices. Even general contracting firms of high standing will take the bait, discounting anticipated difficulties in the sub-contractor's performance by dependence on their own ability to enforce compliance with contract terms as to grade, workmanship and delivery. It is hard to estimate to just what extent stone has been harmed in its standing in the community at large by use under such circumstances.

The investment and scope of operations of finishing mills away from the sources of production exceeds that of the so-called quarry-cutstone plants by considerable. The amount of exterior and interior stone used annually in small quantities for each individual construction is far beyond the aggregate requirements of all the large work offered in the same period. The local man's influence with architects and owners can never be offset by any sum of money which producing finishing mills will or can expend for that purpose. Cutstone plants in the cities are free to purchase any quarry product. In self-defense they foster the specification of that material which gives them a chance. They usually take pride in their work, not because they are vainglorious, but because they have it at their doors constantly to praise or condemn their handicraft.

Cutstone plants in the cities, large and small, are staple trade for the quarries. Producers who cater to their requirements instead of offering them competition usually can lay claim to good will of customers as a substantial and valuable asset. Local concerns do not in the usual course of business, nor can they consistently, patronize quarry-cut stone plants except under compulsion. It may be necessity compelling purchase of low-price stone, or the stultifying need of patronage

so placed in order to placate ruinous competition, but in either event it can be taken for granted that cordial feeling is lacking in the relationship.

An attempt to force a quarry product on the market by any means whatever inevitably brings competing materials to the fore and sooner or later eliminates the opportunity for quantity use in small work as already stated, constitutes the bulk of demand. The stone which thus comes under a cloud is not carried in yard stock. It is shipped only in special work. The gross volume of its application shrinks, its popularity wanes, and ultimately the hastened changes in fashion all but eliminate it from the situation.

Under present day conditions stone cannot afford to have a single one of its constituent, physically meritorious factors fall into disfavor.

#### Offers to Donate Granite for Public Buildings in Duluth

Col. Edwin Romberg, president of the Oriental Granite and Iron Company, of Hinsdale, Minn., has made an offer to Duluth that his company will donate to the city all the granite needed for constructing any future public buildings in Duluth, if the city will pay the cost of quarrying and shipping the material from Hinsdale. According to officers of the Duluth Commercial Club, the offer will effect a considerable saving in the cost of erecting the proposed new federal building and city hall.

#### Rock'Composed of Minute Fossils

Near Reno, Nev., are peculiar beds of diatomaceous earth. This chalk-white material consists largely of fossil microscopic animals called diatoms. These remains have collected here in numbers so immense as to form deposits hundreds of feet thick and in places make up almost the entire mass of the rock. This mass of fossil diatoms, or diatomaceous earth, formerly called infusorial earth, differs from white chalk only in that it is composed of silica instead of lime carbonate. It is so light that it will almost float on water.

## Selling Stone by Sample



LIKE many other kinds of merchandize, stone is very largely sold by sample. Even in the standard stones that have been proved by many years of successful use, it is customary to submit samples. For government work samples must accompany bids, and the specifications bear those familiar words, "equal to sample." But the stone producer is under certain disadvantages, compared with the manufacturer, in preparing samples. The weaver of woolen or cotton goods, for instance, simply cuts off a sample from a bolt of cloth, and the manufacturer of any special article takes a sample from stock. Both can be reasonably sure that if the sample passes inspection the goods that are sold will give satisfaction, providing that inequalities of finish are guarded against. Stone, however, is a product of Nature's laboratory, and there may be decided variations within a single bed or ledge. For this reason there are few problems before the quarryman of greater importance than the preparation of the samples upon which he is to depend for the bringing of business. The subject has rarely, if ever, been treated in any detail, and it may be well to give it careful consideration.

A sample of stone is intended, first of all, to display the color, texture, fineness of grain, markings and hardness of the material. The strength, porosity, chemical composition and various other physical characteristics are usually indicated by analyses and tests. A secondary purpose of the sample may be to show the various styles of finish to which the stone is adapted. If it were not that the fact is so often ignored, it would seem the tritest of commonplaces to say that no successful business can possibly be built up unless the material furnished is a fair match for the samples submitted. This is just as true of the stone as of the woolen or the hardware industry.

When an architect is considering the material of construction for some structure, his fancy may be captivated by some particular markings or by a special tint or shade in the sample of stone before him. He specifies this stone, but when it is delivered on the job he finds that only a small percentage of it has the peculiar qualities he had in mind in making his choice. The quarryman may truthfully say that all stone is likely to show variations in its natural bed and, that it is utterly impossible to match exactly a small sample in the entire material for a great building. But what shall he say when the architect asks him why it is that his sample apparently represents only ten per cent. of the quarry output, instead of the remaining ninety per cent.? Even if his stone is finally accepted for the building, it is a poor business policy if he has disappointed a purchaser.

"Putting the best foot forward" has passed into a

proverb. It is only human nature for the market-gardener to allow the largest and finest apples to rest on the top of the basket. But he need not expect steady customers if there is too large a proportion of speckled and worm-eaten apples under the alluring top-layer. Every quarryman gets to love his stone. If he uncovers a ledge that shows unusual beauties, what more natural than that he should finish some of the stone up with greatest care? But he should keep these exceptional samples for his own private delectation unless he is certain that he can match them fairly in the product he is ready to ship.

Some years ago the writer displayed with pride a beautiful sample of stone from his private cabinet to an experienced stone salesman. "Put that away, quick," said the salesman with a groan. "A sample just like that, of precisely the same stone, cost a company in which I was interested more than \$60,000. I was new to the business, and was after a big order. I picked out the very finest sample that was to be had, and I landed the contract. The stone was cut and shipped to the job, but the architects held us inexorably to the clause in the specifications, 'equal to sample.' Stone after stone was rejected, and the company was bankrupt when the job was completed."

On the other hand, a bidder lost an important contract the other day because the sample he submitted was too hastily selected and did not fairly represent the average stone produced by the quarry. Every stone man in the country knows that these two cases are by no means exceptional, but are, on the contrary, a very common experience.

The wisest business judgment dictates that all samples that are submitted in competition for any building should be chosen with the most scrupulous care to show "the run of the quarry." If such a sample will not land a job, the quarry is more fortunate in the end than if the finished work is accepted, but disappoints the architect so that he will never specify the material again, or if an undue proportion of the stone is rejected at the building. In most quarries the stone varies more or less widely in different beds. In other words, Nature has graded it herself. The trouble often is that the quarryman does not follow this excellent example and grade the stone for the trade. He will submit a sample of what is Grade No. 1, and then wonder that he has difficulty in getting a good deal of Grade No. 2 accepted on the job. If the dealer would frankly submit samples of both the first and second grade stone, and make a difference in the price of each, he would find that it would frequently bring him business. The inferior stone may be exactly as strong and durable and fit for building work as the better grade, differing only in some slight point of appearance.

Architects would often be willing to use the second grade stone in certain parts of some buildings, where it could not possibly be noticed from the street level, if they found that this would materially lessen the cost of the structure.

If a stone is of fairly even texture and color there is little difficulty in getting a sample that will stand as a representative of the entire quarry output. But what is one to do when there are bold markings that cannot be shown wholly in a small section, or where there is mottling and clouding in color and wide variations in texture, as in the case of many marbles and granites? Naturally the more brilliant and attractive portions suggest themselves for samples and yet the temptation to select exceptional pieces must be resisted if disaster would be avoided. There are a number of granites in which the greater part of the groundmass is a medium-grained gray, but freely mingled with porphyric formations in pinks and greens. Neither a sample of the gray nor one of the more highly colored portions can give a correct idea of such a stone, and yet it is almost impossible to show both in a single portable sample. Here the salesman is in a quandary. The best he can do, it would seem, would be to exhibit samples of each kind, explain the formation, and see to it that the architect inspected the quarry itself, where that is possible.

Structural marble usually consists of from 75 to 90 per cent. of pure white crystals, with the remaining proportions made up of darker veinings or mottlings. Strictly from a mathematical point of view, a pure white sample more nearly represents this stone than one that contains much of the darker color. But if a job is sold on the strength of a white sample it may mean ruin to the quarry if the architect insists, as many of them do, upon a "white" building. The history of the stone trade is full of disputes of this kind, involving hundreds of thousands of dollars.

There is one other point in the preparation of samples to which attention should be directed. It is frequently the custom to make a cube so that it will show all of the different styles of finish, rock-faced, rubbed, polished, tooled, hammered or picked. As a general sample, to reveal the full capability of the stone, this is excellent. But as a sample for a particular job, it may be unfortunate. The better way is that the sample should show only the style of finish that is to be used in the building. If a granite building, for instance, is to be hammer-dressed, a polished sample may completely mislead the architect. So with a rubbed sample for a rock-faced building, or *vice versa*. The architect will demand a sample finished in the style desired before the contract is closed, but the first impression is always what counts. An architect who is enthusiastic at first but cools off afterwards is harder to deal with than one who has to be warmed up gradually to a realization of the full beauty of a stone. The thing to be remembered always in selling stone by sample is

that even a fat profit on a single building is a mighty poor investment if the architect is bitterly disappointed in the finished structure.

### Pratt's Statue of Bishop Brooks

A striking statue of the late Bishop Phillips Brooks has been modelled by Bela L. Pratt, the sculptor. It has been suggested that this statue, which stands nine feet six inches high, find a permanent setting in some part of old Boston which Dr. Brooks dearly loved.

Mr. Pratt has chosen a moment in the life of the preacher which for years left an indelible impression on his memory. It was only a single glimpse that he got of the Bishop in a church in Madison Avenue, New York, but, as he stepped inside the portals, he saw the commanding figure clad in his preaching gown. It has been an earnest wish of Mr. Pratt since that day to preserve that splendid memory in a statue, and this is the result. Simplicity and greatness are the two characteristics which the sculptor has sought to preserve. The likeness shows the Bishop in an attitude familiar to those who remember him in the pulpit or on the platform.

A committee has been formed in Boston to raise a fund for the purchase of this statue.

### The Decay of Craftsmanship That Follows Specialization

In view of the definite advancement and continual development in the mechanical equipment of modern buildings, the improvements in structural design, and the advance in the science of planning and general architectural treatment, it is very evident that along with this universal advance there has been no improvement, but rather a decline in craftsmanship of workers of all kinds—that is, a lack of manual skill plus individuality and initiative, says M. D. Hite, a New Orleans architect.

The worker today is more highly specialized than in days before the advent of manufactured products and appliances in building, and today he is only a tool rather than a co-operative agent of the architect's. The modern system has extended, by its very nature, and the day of the individual craftsman is gone, except in a limited field. But along with this decline of artisan-thought has been a decline in the general quality of the worker himself. The architect's well-studied drawing and thoroughly developed details, as exhibited in any set of up-to-date plans, leaves little to the workman's imagination or ingenuity. In olden times it was different; for then drawings were crude and extremely incomplete, and planning was not complex. In many respects the modern process has been well for the architectural profession, placing the sole responsibility for the result in the hands of the architect, has extended his power and his potential capacity. The artisan, however, has suffered by this.

### Conditions in Carrara

The resources of the Province of Massa-Carrara lie in its well-irrigated and fertile soil, and in the working of the world-renowned Carrara marble quarries, writes Consul General David F. Wilber, from Genoa. The wealth of the City and Province of Carrara, which has a population of 220,000, is derived from the 500 quarries which give employment in one way and another to over 8,000 workmen.

The quarries are situated in the mountains above the town, and the stone is brought down to the plain to be sawed and worked, largely in shops connected with the homes of the workmen. Explosives are used to obtain the largest size blocks, although wire saws driven by electricity are used in a few instances to quarry the blocks to the desired dimensions. The high cost of operation, however, prevents a more extensive use of this system.

The quantity of marble quarried in the commune of Carrara in 1914 was 207,001 tons, as compared with 245,660 tons in 1913, while in Massa it was 44,117 and 51,250, respectively, notwithstanding the fact that the production during the months of August and September was only one-third of that for the corresponding period of 1913.

At the beginning of the year 1914 most of the quarries were idle, for the strike, which had started in the latter part of 1913, had not been settled. But by February 1 nearly all had resumed operations and the prospects for a record year were excellent. Orders from abroad were good, and the production for six months ended July 31, 1914, was 17 per cent. greater than that of the corresponding period of the preceding year. But with the outbreak of the war orders from the belligerent countries practically ceased; and, because of the moratorium and the unsettled state of business, many of the quarries were forced to stop work entirely for some months. Production fell off steadily until the end of the year, when only one-fifth of the normal amount of stone was being quarried. This industry suffered more than any other in this district because of the political conditions in Europe, and there has been a great deal of unemployment. The fact that the United States takes one-sixth of the total exports of Carrara marble, and that North and South America together buy about one-third of the exports tended to prevent a total cessation of work at the quarries.

### Monument to a Pioneer Geologist

The Department of the Interior has just completed, on the rim of the Grand Canyon, in Arizona, a memorial to Major John Wesley Powell, the intrepid pioneer and celebrated scientist who first explored the Grand Canyon. The memorial is an altar decorated in Indian imagery and supporting a bronze tablet, resting upon a pyramidal base of rough-hewn stone. Fifteen steps lead from the west up to the altar floor, from which one may gaze into the very heart of the glowing

mile-deep canyon. It is a structure worthy alike of the rugged, forceful personality of the man and of the titanic chasm which it overlooks.

The spot chosen for the memorial is Sentinel Point, a promontory south of the railway station, which commands a particularly fine view of the Granite Gorge and of the river, whose unknown terrors of whirlpool and cataract the Powell party braved in small open boats. The structure, which is built of weathered limestone from the neighborhood, has a rectangular base 21 by 28 feet. The altar carries on its east side a medallion portrait of Major Powell in bronze bas-relief by Leila Usher and the following inscription:

"Erected by the Congress of the United States to Major John Wesley Powell, first explorer of the Grand Canyon, who descended the river with his party in rowboats, traversing the gorge beneath this point August 17, 1869, and again September 1, 1872."

John Wesley Powell was born at Mount Morris, N. Y., in 1834. He served in the Civil War, and lost his right arm at the battle of Shiloh. At the close of the war he became a professor of geology, and in 1881 he was made director of the United States Geological Survey, serving until 1894, when he resigned.

### Marble in the Philippines

The Island of Romblon is, for its size, one of the most prosperous and thrifty of the Philippine Islands. Its population is about 35,000. It has three profitable industries which yield a good annual return to the people after paying for the principal food staple of the people—rice—which is largely imported. Copra, white marble and buri hats are the exports which account for most of the island's prosperity. It is estimated, says a recent writer, that there are some 12,000,000,000 tons of marble in sight in the island's deposits. The crushed and block marble sells for \$7.50 a ton, while the statuary marble sells for \$60. Lime 99.6 per cent. pure has been produced from this marble. The marble quarries are in many instances under cocoanut groves. Some time ago we printed a photograph of a Philippine school house of stone, built entirely by young Filipino school boys. This was sent us by one of our subscribers in the island of Romblon, who conducts a prosperous marble works, and quarries his own marble.

### Stones from England to Restore Mount Vernon

There has just been received at Baltimore, a consignment of stone from Middleboro, England, to be used to restore the portico of Mount Vernon, Washington's home. There are twenty-one cases of the stone, obtained from the quarry which supplied the original stone of the structure, over 150 years ago. To T. W. Ridley, Justice of the Peace at Middleboro, is due the success of the committee for getting the stone quarried for the purpose of restoration. Several samples of the stone, much worn, were sent to Mr. Ridley by the committee having the matter in charge.



# STONE

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A NEWSPAPER paragraph gives a sketch of the business of a company that makes a specialty of hoisting machinery. The unsophisticated reporter, in describing the output of the company, declares that it turns out each year about 250 derricks, each one with a capacity of 4,000 tons. A derrick that could lift 4,000 tons would be an extremely interesting sight and would make it possible for the moderns to cast completely in the shade the remarkable achievements in masonry and stonework of the ancient Egyptians. The quarryman who can handle 40 tons in one load in these days congratulates himself upon his equipment.

THIS magazine endeavors to discuss in the broadest and most liberal spirit all questions that are vital to the stone industry. For this reason we welcome to our columns articles that consider in a frank and honest manner vexing problems that may confront the trade. It must be understood, of course, that this magazine is not to be held responsible for the personal opinions of its contributors, and that they do not, of necessity, represent our editorial policy. The progressive spirit of any industry is to be measured by its willingness to look facts and conditions squarely in the face, and to consider both sides of every question. If our readers take exception to any opinions expressed in these pages, we invite them freely to contribute their own views. Nothing is gained by merely condemning one man's opinion. A frank presentation of opposing arguments may count for much.

THE National Cut Stone Contractors' and Quarrymen's Association of North America will hold its thirteenth annual convention at the Hotel Traymore, Atlantic City, N. J., on the 19th and 20th of this month. The executive committee will meet at 5 P.M. on January 18th, while the convention itself will be called to

order at 10.30 the following morning. An address of welcome will be delivered by Hon. Wm. S. Riddle, Mayor of Atlantic City. After the transaction of the usual business of the Association, there will be the social features, which promise to have unusual attraction this year. Atlantic City is splendidly fitted for winter conventions and the entertainment committee has been active in arranging a special programme. The general revival of business throughout the country indicates that the coming year will have an unusual importance for the entire stone industry, and all the conditions affecting the trade should have frank and free discussion. There should be a record-breaking attendance at this meeting, as it will be one of the most important in the history of the organization.

THE Commissioner of Public Works of Troy, N. Y., recommends to the Mayor and Board of Estimate and Apportionment that the city undertake the erection of a stone crushing plant at a cost of \$100,000. The Commissioner says that the city at the present time is purchasing broken stone at a low price in the open market, but that with a plant of its own, the cost would be reduced more than one-half. This may sound convincing on paper, but we beg to assure the commissioner and the public officials of Troy that the general experience of other communities that have established municipal stone plants, is precisely to the contrary. It would be safe to say that for every new public stone plant that is established, an existing one is abandoned. For street work, the demand for stone is for a limited period only and during the rest of the year the plant is, of necessity, idle. In many instances, city engineers and commissioners of public works, after careful examination, have proved to the satisfaction of the taxpayers that it is more economical and satisfactory in every way to purchase crushed stone in the market rather than for the city to produce it itself even where the labor of workhouse inmates or convicts is utilized.

A WRITER in a technical paper advocates the use of artificial stone or cement bricks for building fireplaces. It is difficult to understand why any one would care to employ a sham material for such a purpose, when a fireplace of natural stone could be built for very little if any more money. There can be no question that far more artistic effects can be secured with stone than any other material. A fireplace is the most prominent feature in any room that contains it, and it is a very poor judgment that would slight this important ornamentation for the sake of a few dollars. For most rooms modern taste does not demand the ornate mantels and fireplaces of richly carved, moulded or polished marble that were invariably required several decades ago. Instead, what is generally wanted is a fireplace and chimney hood in simple, dignified lines, of sand-rubbed stone laid up in plain masonry. There need be little carving or moulding, and the cost of construction in



natural stone is extremely moderate. With a little care, choice can be made of a stone that is virtually fireproof, so that even the chimney lining can be of the same material, thus preserving perfect harmony. Stone is available in the richest and warmest color, and there is no artificial material that is comparable with it for one instant in beauty and artistic effect, or, indeed, in ultimate economy of cost.

A WESTERN iron company, which has a deposit of granite on its property, has made an offer to donate to a city all the granite needed for the erection of future public buildings if the city will pay the mere cost of quarrying and transporting the material. At the first glance, this seems like a generous and public-spirited offer, but there is another aspect to the proposition that should be taken into account. What of the quarry companies that have invested large capital in the vicinity and are endeavoring to build up with fair competition an enterprise that is profitable to the state? The donors make their money in another line, and can well afford to give away what is a waste product to them now. If the quarry companies happened to have rich iron deposits on their property and offered to allow this to be mined free of cost, would the iron company regard this as an absolutely square deal, even if it should somewhat reduce the cost of public buildings? It is on a par with the efforts of so many states and municipalities to establish quarries to be operated with convict labor. There are no monopolies or trusts in the stone business, and "the laborer is worthy of his hire" in this industry as well as in every other.

### Important Granite Quarry Change

One of the most important changes in the granite interests at Barre is made known in the announcement that Dr. H. Nelson Jackson, of Burlington, Vt., and his brother, Attorney S. Hollister Jackson, of Barre, have purchased a half interest in the well-known granite quarrying corporation of E. L. Smith & Co., of Barre. It is expected that Dr. Jackson will take an active interest in the management of the concern.

E. L. Smith & Co. own one of the best and largest series of quarries and quarry land on Millstone Hill. The corporation holds title to 135 acres of quarry and quarry land, while it leases the so-called Gazeley quarry of 100 acres. Within the past two years the corporation bought of D. M. Miles, or the Millstone Granite Company, 67 acres of quarry and quarry land, and recently it purchased the Wilson farm of 275 acres with a view to making the largest and most accessible dumping ground for waste granite stock. It is proposed to build a railroad track onto this farm so that grout can be dumped from railroad cars, thus facilitating the work of disposing of the waste material.

This great property is the development from an industry started by Emery L. Smith, of Barre, back in 1868. He retired from the firm in 1895, selling to John

E. and Donald Smith, who were then manufacturing granite in a plant on Burnham's meadow. These latter gentlemen gradually added valuable quarries to their original purchase. In 1908 E. L. Smith & Co. was incorporated, and upon the decease of John E. Smith a few years ago the corporation purchased the stock belonging to his estate; and until the present transaction the principal stockholder has been Donald Smith, its president and manager, whose knowledge of quarrying has in a very large degree contributed to the success of the business. The company is incorporated for \$200,000. Other officials are Angus A. Smith, vice-president, and E. O. Kent, clerk and treasurer. The corporation carries about 250 employees on its books, and its quarrying operation constitutes one of the most important in the Barre granite belt.

### Safety in Stone Quarrying

The United States Bureau of Mines has issued a bulletin by Oliver Bowler with the above title. The Bureau, in connection with its work relating to the increase of safety in the mineral industries, is investigating quarries, and quarrying methods. This paper describes the results of an investigation of safety conditions in stone quarrying—more especially in the quarrying of marble. Its purpose is to point out the chief causes of accidents in stone quarries and to suggest preventive measures and devices. Many of the suggestions are applicable to all types of rock excavation, but relate chiefly to marble quarrying. Accident prevention is considered from three points of view—safety in equipment, safety in quarrying methods, and safety through proper care. The paper also describes methods of first aid in case of accident and includes a list of typical quarry accidents that have come to the writer's notice.

### Quarry Notes

The commissioners of Multnomah County, Ore., have authorized the opening of a rock quarry at Kelly Butte, near Portland, where unemployed men may be given work. The crushed stone produced will be used in the parks of the city.

The Sturgeon Bay Stone Company, of Sturgeon Bay, Wis., has purchased property from the Consumers' Ice Company, of Chicago, in the town of Nasewaupsee, near Sturgeon Bay. The property consists of about 69 acres of land and this will be added to the present holdings of the Sturgeon Bay Stone Company, which has been operating a quarry on these premises during the last fifteen years or longer. About 49 acres will be cleared for farming purposes, and the remainder retained as a quarry.

The Rock Cut Stone Company is taking advantage of the weather conditions to make repairs and additions to its extensive plant at Rock Cut, near Jamesville, N. Y.

### Sale of a Slate Property

The plant of the Delaware Water Gap Slate Company, consisting of between twelve hundred and fifteen hundred acres, located in Knowlton township, N. J., was sold under foreclosure at Belvidere to Jos. L. Bodine, of Trenton, N. J., represented by the Philadelphia Trust Company, for \$1,000.

## Working Ramp-on-Twist Coping

It is required to set out the face moulds for stone coping for a wall of given double curvature or ramp-on-twist.

The method here adopted of dealing with this problem, while perhaps not so economical as regards material as the method of tangent planes, is, however, more comprehensible, and yields truer forms when worked, whilst the extra cost in material is more than saved by reduced cost in working, says a writer in the *Building World*. Fig. 1 shows a horizontal plan of the coping  $A B C D$ , which must be set out full size on a board or platform. Divide the convex line  $A B$  into any number of equal parts (in this instance fourteen), as 1, 2, 3, 4, 5, etc., and draw radiating lines through the concave line  $C D$  as  $1', 2', 3', 4', 5'$ , etc. The line  $A' B'$  shows the development of the convex line  $A B$  when stretched out or unfolded in a straight line. This development is obtained by stepping out the line with the compasses, or by bending a thin lath round the line and laying it out straight.

Fig. 2 shows the development of the coping, the curved line being drawn at pleasure or struck from centres as in this example. The line  $A B$  is transferred from line  $A' B'$  on plan (Fig. 1), and is equal to the convex line  $A B$  (Fig. 1). On this line set off the divisions 1, 2, 3, 4, 5, etc., and erect ordinates or perpendiculars cutting the line of curve, and with the same notation. Develop the inside or concave line in the same manner as described above. On the divisions  $1', 2', 3', 4', 5'$ , etc., erect ordinates, making them the same height as those of the convex side, namely, 1 equal to  $1'$ , 2 equal to  $2'$ , 3 equal to  $3'$ , etc., and through the points of intersection thus obtained draw the curved line required.

The block of stone required to work the top piece of coping will be rectangular in shape, of the extreme length of the bed

mould  $f b$  (Fig. 1), whilst the width will be equal to the distance across the chord line, and the height will be that of the face mould from  $g$  to  $h$  (Fig. 2). Begin by working the bottom bed to a true plane, and the top bed parallel to it, taken to the height of the face mould  $g h$  and  $f e$ , each as a surface of operation. Scribe the bed mould  $f b f d$  in on each bed, care being taken to hone the points through so that the moulds are perfectly out of twist, and proceed to work the concave and convex surfaces. For guidance in working this to a true form, radiating lines are marked on the beds taken from the mould, and the straightedge is applied on the face to drafts coinciding with these. At this stage the stone is a true segment of a hollow cylinder, as shown in Fig. 4. Now apply the face moulds from the development to the convex and concave faces, and scribe them into their respective shapes and work the joints through. The top bed or surface of operation is now done with except at the high corner  $h$ . Point off the superfluous waste, and chisel the top through clean, keeping the drafts straight at the coinciding points 7, 7', 8, 8', 9, 9', etc., thus giving the proper twist.

The underside of the coping may be treated in a similar manner unless the horizontal bed is left for fixing. The bottom piece of coping is worked similarly. Fig. 3 shows the section of the coping.

### Business Brevities

The Limestone Transportation Company has placed an order with the American Shipbuilding Company for a large freight boat for use in the transportation of limestone on the Great Lakes, to be ready for delivery in 1917.

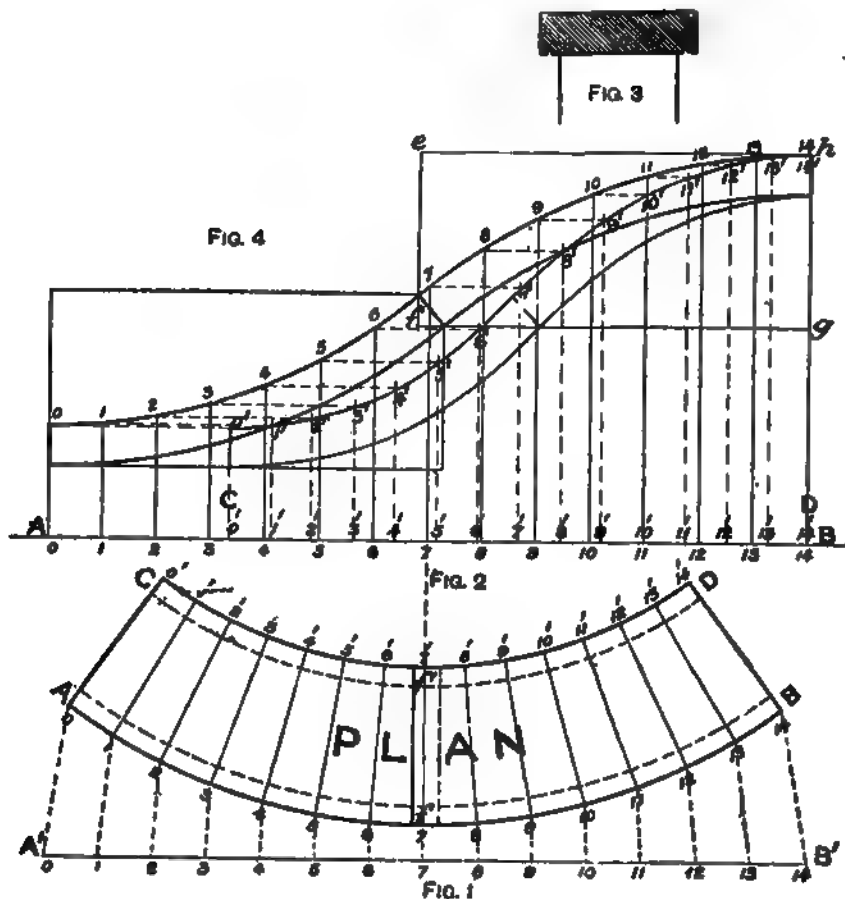
The Callison-Price Stone and Lime Company, of Middlesboro, Ky., has changed its name to the Price Stone and Lime Company.

The Ohio Oolitic Stone Company, of Bloomington, Ind., has changed its name to the Leonard Springs Quarries Company.

Organized labor of New York State will erect a monument at a prominent place in Albany in memory of the late Daniel Harris, who for years previous to his death, was president of the State Federation of Labor, and a loyal and devoted champion of labor. A levy of 1 per cent. per member is to be made each year until an amount sufficient to cover the cost of the monument is raised.

Representatives of the Patriotic Societies of Omaha are considering plans for building a memorial arch in that city to replace a temporary arch of welcome recently erected in a prominent location. The organizations want a memorial in honor of the nation's soldiers and pioneers, to cost perhaps as much as \$50,000.

At the closing of the Erie Canal for the season, it was announced that while there had been a considerable increase in shipments of general merchandise over the canal during the past year, there was a falling off in the amount of stone, lime and clay that was transported.



John K. Cullin, a Civil War veteran, who died in Troy, N. Y., some time ago, left \$10,000 for the erection of a soldiers' and sailors' monument at Hillsdale, New York.

The two-story building at the plant of the General Crushed Stone Company, at LeRoy, N. Y., used as a blacksmith and repair shop, was destroyed by fire during the past month.

The Missouri Valley Marble and Tile Company, of Omaha,

Ashley Falls, Mass., with its machinery and other equipment, was destroyed by fire a few days ago. The loss is estimated at about \$100,000. The cause of the fire has not been determined.

The plant and equipment of Frank Ittenbach & Sons, cut stone contractors, at Twenty-first and Montcalm Streets, Indianapolis, will be sold by the receiver on January 12, 1916. The inventory of the property amounts to nearly \$30,000.

Geo. H. Royle will carry on the cut stone business on Pennington Avenue, Trenton, N. J., established by his father, Thos. Royle, who died the past month.

### New Companies

The King Granite Machine Company, of Milford, Mass., to manufacture machinery for working granite. Capital, \$26,000. Incorporators, Frank McQuaid, John Nolan, Edward M. King.

The Romayor Gravel Company, of Beaumont, Tex., to deal in gravel and stone, etc. Capital, \$20,000. Incorporators, E. A. Fletcher, J. F. Keith, and Geo. D. Anderson.

The Lafayette Hydraulic Gravel Company, of Lafayette, Indiana, to mine, excavate and sell gravel, sand and crushed stone. Capital, \$60,000. Incorporators Lydia Duncan, F. Lee Duncan, Mary S. Dunavan, and Silas H. Dunavan.

The Wiggins Crushed Stone and Sand Company, of Dayton, Ohio, to quarry and crush stone, etc. Capital, from \$65,000 to \$200,000.

The Meadowbrook Marble Company, of Boston, Mass., to manufacture and sell marble. Capital, \$300,000. Incorporators, Alton F. Tupper, Daniel J. Shea, and Fred E. Houghton.

The East New York Monument Works, Inc., of Brooklyn, N. Y., to manufacture and deal in marble, granite, etc. Capital, \$20,000. Incorporators, E. Weiss, J. Haskel, and S. Raiken, 32 Chester Street, Brooklyn, N. Y.

The Pennsylvania Black Granite Corporation, of Bronx, N. Y., to quarry stone, construct buildings, etc. Capital, \$10,000. Incorporators, A. Tozzing, W. Parsons, and F. Tarantino, 832 E. One Hundred and Forty-seventh Street, Bronx.

The Manhattan Cut Stone Company, of New York, to do a general cut stone business. Capital, \$5,000. Incorporators, Edna J. Siess, Theresa Schulman, Ellen Greenhy, 535 Manhattan Avenue, New York City.

### Hygiene and Granite Cutting

Occupational diseases and vocational hygiene were discussed at a recent meeting in Quincy, Mass., and an address was made by Alexander W. Russell, secretary of the National Granite Cutters' Association. Mr. Russell gave his views as to the great occupational disease of the granite cutters, tuberculosis. This comes largely from the dust raised by the granite tools. Efforts are being made to devise suction pumps that will carry away the dust. Until this is perfected, until it is fully practical, much could be gained by a closer observance of the ordinary laws of hygiene. Many of the sheds are improperly ventilated, and Mr. Russell thought that slide windows in the sheds would improve conditions. In the west, where the sheds are wide open and the air circulates freely, the percentage of tuberculosis among the cutters is very appreciably less than in the east. Much was gained by placing the surfacing machines as far from the sheds as possible, but the area of many plants was too limited to allow these to be located at a suitable distance. Another source of danger was the common drinking pail, generally open to the air, and soon full of stone dust and chips.

### CHAPEL OF THE NORTH TRANSEPT, LAON CATHEDRAL

The Cathedral is notable as having no eastern chapels to the choir. From a sketch by J. Tavenor Perry in the *London Architect*

Neb., has moved to a new location, at 1729 Howard Street, in that city, owing to an increase in business.

A contract for the erection of a monument to Dean Barry, to be erected in St. Paul's Cemetery, in Oswego, New York, has been let to the Harrison Granite Company, of New York. It will take the form of a large Celtic Cross and there will be a bronze bust of the deceased clergyman.

The cooper shop of the Rockland and Rockport Lime Company, at Rockland, Me., was damaged by fire during the past month to the extent of \$25,000. The building was filled with valuable machinery and stock.

A movement is on foot in Boise, Idaho, to take over the complete rock crushing equipment owned by the Government that was used in building the Arrow Rock Dam. The plant, which is less than twelve miles from Boise, is no longer in use by the Government. It consists of three gyratory crushers.

The New Jersey Retail Monument Dealers' Association will hold their mid-winter meeting at Trenton, N. J., on January 17 and 18.

The plant of the Southern Berkshire Marble Company, at

## Code of Procedure for Marble Men

THE twelfth annual meeting of the National Association of Marble Dealers, which was held in this city in November was reported in these columns last month. Important action taken at the meeting was the adoption of a Code of Practice. Inasmuch as the membership of the Association embraces the leading marble workers of the entire country, the importance of the Code can readily be understood. It is as follows:

RESOLVED BY THE BOARD OF DIRECTORS OF THE NATIONAL ASSOCIATION OF MARBLE DEALERS—that the rules for bidding adopted at the annual meeting of the Association held in New York City, November 11th and 12th, 1915, be hereby promulgated as an expression of opinion on the part of the Association of fair methods of competitive bidding in the marble industry and that a copy of these rules be printed as a Code of Practice recommended for adoption by all persons to whom members of this Association are bidding; the object of such recommendation being to promote fair and equitable practices in the marble industry, it being understood that the National Association of Marble Dealers does not in any case sanction combination to fix prices or restrain competition.

1. A general contractor, having been awarded a contract involving interior marble—his estimate having been based upon sub-estimates—should award the contract for the marble work to some one of the solicited bidders at the price named by said bidder. He should, in his own bid, announce the name of the successful marble bidder and award the contract to him immediately after the closing of the general contract.

Any bid for marble work, received and knowingly opened as such by the general contractor prior to the opening of his own bid, should be considered a solicited bid, whether submitted at the request of the general contractor or not. Every marble contractor submitting a bid should enclose it in a sealed envelope marked on the outside with his name and address, and also as follows: "Bid for interior marble for ....."  
(insert the name of the building and architect). Any general contractor receiving such a bid may return it unopened at any time prior to the submission of his own bid, and in such case, it should not be considered as a solicited bid.

2. If a general contractor secures a contract for a building involving interior marble, without making use of or receiving bids upon the marble work prior to securing the contract, he should in subsequently soliciting bids for the marble work, name a date upon which the bids will be opened, and in handling such bids, should be governed by the requirements of paragraph No. 1.

3. If owners or architects are receiving separate bids for the different classes of work, they should be governed by the requirements of paragraphs 1 and 2 in reference to each of the sub-contracts, including the marble.

4. Any general contractor, or an owner or architect, receiving and opening bids on marble work, should keep them confidential until the marble contract has been awarded. The only satisfactory alternative to this is to appoint a date for the opening of bids and then to open and read them publicly in the presence of all the bidders. Either plan is sanctioned by this Association. Divulging information relative to bids in such a manner as to result in favoritism, as between different bidders is condemned, no matter how it may be brought about.

5. Fair and just dealing requires that the contract for marble work be awarded promptly to the satisfactory bidder at the price named in his bid without attempting to dicker or trade between the bidders themselves or with other parties who may not have submitted bids. If for any good reason

new bids on revised plans must be asked for, every bidder whose bid has been opened in the first instance, should be permitted to bid at the second opening. The requirements of the foregoing paragraphs relative to bidding in the first instance apply also to subsequent bids taken upon revisions.

6. A contract for interior marble work should be made on a form which will conserve the just rights of the marble contractor, preferably the standard form of the National Association of Marble Dealers. In no case should it require any of the following charges to be borne by the marble contractor: General cleaning, plaster patching, office or telephone service, light, heat, insurance on materials in the building (whether set in place or not), and use of general gangways and hoisting facilities. All of the above charges should be borne by the general contractor and not by the marble contractor, on either a pro rated or any other basis. They are all matters which can be more economically handled by the general contractor, which cannot be controlled by the marble man, and which, for that reason, cannot be accurately estimated by him. The marble man should base his bid upon the manufacture of his material, transporting it to the building and distributing it therein and subsequently setting it in place—the building having been prepared for its reception in accordance with the plans. Nothing else should be included in either bids or contracts as the duty of the marble contractor. Bids should be so worded as to specifically include the work above described as belonging to the marble man, and specifically exclude everything else. The contract should provide for prompt monthly payments and require final inspection and payment in full within thirty (30) days from the completion of the marble work, regardless of the final settlement for the building as a whole or for the work of any other trade.

7. A contract having been awarded for given grades of marble, it should be understood that reasonable variations from any small sample are inevitable and must be accepted, and that the job is to be executed in the grade or grades specified as generally understood in the trade. In the event of disagreement about this matter or about the standard of workmanship involved in manufacturing and setting the marble, the matter should be arbitrated by two arbitrators, both of whom should be skilled in the marble business but not interested in the particular job. One of them should be selected by the Secretary of the National Association of Marble Dealers and one by the Architect. If necessary, the arbitrators should agree upon an umpire, and the decision of any two should be binding on all parties

\* \* \* \* \*

8. A marble contractor, having been offered a contract in accordance with his bid and these rules, must accept it and do the work.

\* \* \* \* \*

9. After January 1, 1916 no member of this Association shall sign any contract that does not include the following provisions:

Hoisting facilities, the use of gangways, the necessary heat, water, light and storage space must be provided without expense to the marble contractor.

The marble contractor shall not be required to cut any work except his own and he shall not be required to cut his own work as a result of inaccuracies in the building without being paid for it as extra work.

The marble contractor shall not be required to pay any specific or prorated charges based on any of the following items:

Plaster patching, general cleaning, fire insurance, general

office expense, stenographer, watchmen, or erection of any temporary structure.

Time lost by reason of strikes or lockouts shall be added to the time of completion of the work covered by this contract.

Any differences arising between the parties hereto shall be subject to arbitration as provided in the Standard Contract Documents of the American Institute of Architects.

Losses by fire or any other losses not in the control of the marble contractor shall be carried by the owner or contractor and furthermore if a bond is required it be paid for in addition to the price quoted for the work.

\* \* \* \* \*

10. On every proposal for marble work submitted by the members of this Association must be stamped or printed the following:

#### FORM OF PROPOSAL FOR MARBLE WORK

(Adopted by the National Association of Marble Dealers, November 12, 1915.)

This proposal is based upon the following conditions:

(1) Loss of time due to strikes, lockouts, or any cause beyond the control of the marble contractor to be added to time of completion.

(2) The use of hoisting facilities, gangways, the necessary water, heat, light and storage space in the building to be provided by the owner or general contractor without expense to the marble contractor.

(3) No charges to be made against the marble contractor for plaster patching or for general cleaning. The marble contractor to be required to cut no work but his own; if his own work should have to be cut on account of inaccuracies in the building it shall be paid for as extra work.

(4) No specific or pro-rated charges for the use of telephones, general office expense stenographer, watchman or temporary structures is included in this proposal. No allowance is made for pro-rated charges of any sort or description.

(5) This proposal is based upon the assumption that the fire insurance on the marble whether merely delivered at the building or set in place, will be carried by the other party to the contract without expense to the marble contractor.

(6) This proposal is subject to the conditions of the Standard Form of Contract adopted by the National Association of Marble Dealers, November 14, 1912, and to the conditions of the Rules for Bidding adopted by the National Association of Marble Dealers, November 12, 1915.

(7) If a surety bond is required in connection with the marble work, add.....

(8) This proposal is subject to acceptance within..... days from date and is void thereafter, at the option of the undersigned.

To.....

We (or) I, hereby propose to furnish.....\* \* \* shown and described in and by, and in conformity with, the plans, drawings and specifications for said building made by....., the authorized architect employed by the owner of said building, which plans, drawings and specifications are as enumerated as below:

.....\* \* \*  
Respectfully submitted,

For some time there has been an agitation throughout the country for standard specifications, and the adoption by a large and influential body in the stone trade of a Code of Procedure and uniform proposals is a move in the right direction. The Code has been issued in a neat booklet for the benefit of the members of the Association of Marble Dealers.

## Notes from the Stone Fields

### MARBLE AND GRANITE

The Lee-Otis Section of the Lee-Huntington Trolley Line has just been opened for traffic. This is due in large measure to the Hudson Granite Co., which has now begun to make heavy shipments over the line to Lee. The shipments consist of block granite and paving blocks. The Hudson Granite Company will probably now turn most of its attention to the Otis quarry, as the cost of getting the granite from the South Becket quarry has been increasing, owing to the depth of the pit. In Otis, the granite lies close to the surface and is very easily quarried.

Hartford's new Municipal building, built of granite according to suggestions of the late John M. Carrere and costing \$1,400,000, has been dedicated. The exterior architecture, in the late Georgian style, is comparable in period and composition to the present City Hall, which was built in 1796.

The owner of a granite cutting plant in Los Angeles has successfully used the compressed air starter on his automobile for operating the pneumatic tools used in lettering on monuments. Air is conducted by a hose from the air reservoir on the auto to the pneumatic tool and the plan works admirably, saving considerable time and expense in the work of lettering on monuments at the cemetery far away from the shop.

A Vancouver company recently shipped from its quarry on Nelson Island, two granite shafts each 3 ft. by 18 in., and 22 ft. in length. This quarry furnished the granite used in the construction of the provincial court house in Vancouver and the Government buildings in Victoria.

The Hamilton National Bank at Seventeenth and Champa Streets, Denver, will erect a new marble front to their banking building. The base will be of Verde Antique marble, while the structure will be of White Colorado marble.

The Security National Bank, of Los Angeles, Cal., will erect a new granite banking building on Spring Street, in that city, to cost about \$300,000. John Parkinson, of Los Angeles, is the architect. The interior will be finished in marble.

The contract for the Benjamin Ide Wheeler Hall on the University of California campus has been awarded to the Raymond Granite Company, of San Francisco, for \$225,000. Strikes among the granite cutters in the southern part of the state have interrupted operations and delayed the letting of the contract. This hall will be a four-story class-room building, costing about \$800,000. It will have space for 3,500 students and will contain studies for more than sixty professors.

A deed has been filed at Towson, Md., conveying to the Baltimore Quarries Company, for \$21,000, the property of the Calvert Quarries Company.

Jas. Salter has leased a lot on the corner of Market and Second Streets, Red Oak, Iowa, and will erect a marble and granite cutting plant, employing about sixteen men.

The directors of a bank at Grand Rapids, Mich., have paid a visit of inspection to the marble quarries in the vicinity of Knoxville, Tenn., with the view to contracting for Tennessee marble, to build a fourteen story home for the Grand Rapids Bank.

The new Community Mausoleum at Dublin, Ga., is just being completed. The interior is entirely finished in polished Georgia marble.

Announcement has already been made in these columns of the purchase of the old R. C. Fisher Marble plant, occupying an extensive area at the foot of Locust Avenue, New York, with a large frontage on the East River, by C. D. Jackson, of this city. There has now been incorporated the Port Morris Industrial Terminal Company, headed by Mr.

C. D. Jackson, which will improve this property. The new company, it is reported, contemplates the erection of a building to contain about 500,000 square feet of space and connect with new piers to be built. The freight systems of the New York, New Haven & Hartford, and New York Central Railroads, have sidings on the property and there is a mean depth of water of from thirty to forty feet along the pier line.

To commemorate the 150th anniversary of the founding of the Patrons, the Pioneer literary club, of Philadelphia, will erect a granite memorial to Geo. Henry Boker, the dramatist and one-time United States Minister to Russia. The monument will be in the form of a giant column, severely chaste, and will be placed in Fairmount Park, near the celebrated Tom Moore cottage.

G. Reinke & Company, marble and granite workers, are building a new plant of brick, 100x30 feet in size, at the corner of South Main and Ninth Streets, Oshkosh, Wis.

A location is being sought for a new marble works at Gadsden, Ala.

The contract for the granite work on the Civic Center Library in San Francisco has been awarded to McGilvray-Raymond Granite Company, of that city, for \$350,869. The work is to be completed next July. The lowest bid for the interior decoration was \$42,396. The work on the building has been delayed by the strike of the cutters.

There has just been shipped from studios at Pietrasanta, Italy, a marble tablet reproducing the Last Supper, by Da Vinci. This is for the high altar in the Church of St. Mary of the Angels at Olean, N. Y., and is to replace a former tablet of the same nature that was cracked.

#### LIMESTONE AND SANDSTONE

The new home for the Friars Club, at 106-110 W. Forty-eighth Street, New York, is now nearing completion. It is from plans by Harry Allan Jacobs. It has a frontage of 61 feet and is seven stories in height. The exterior has been designed in Tudor Gothic Style, giving the effect of a monastery. It is built of Indiana limestone.

Thos. Hooker, of Syracuse, New York, has organized the Niles Lime Company, which has started the manufacture of land limestone at his quarries at Hookers' Landing, on Skaneateles Lake, New York. It is expected that the capacity of the plant will soon be doubled.

The Nast Bros. Lime and Stone Company have just started work in a new hydrated plant at Marblehead, Wis. In addition to the Marblehead plant, the company owns and operates plants at Knowles, Wis., Nasbro, Wis., Kewaunee, Wis., and South Germantown, Wis., with stone crushers in connection at each place with daily capacity of 3,000 barrels of lime and 2,000 tons of crushed stone.

One of the kilns of the El Paso Lime Company, at El Paso, Tex., was destroyed by a dynamite blast during the past month. The damage will amount to \$1,500. The lime company's plant was only recently completed and had been in operation for but three weeks. Officials of the company say they know no reason why the plant should have been dynamited.

The Gouverneur Limestone Company, recently organized, is rushing work on its new plant at Gouverneur, N. Y. It is expected that it will be ready for operation shortly. The machinery has been removed from a plant at Canton. The new industry will be operated by electric power, furnished by a public service company.

The Bank of Long Island has just opened for business its new banking building at 5 Skillman Place, Long Island City. This is an artistic building, the exterior of Kentucky Limestone, and the interior finished in marble.

The New Miami Hotel, at Dayton, Ohio, has been completed and opened for business. This was designed and erected by H. L. Stevens & Co., of Chicago, and costs more

than \$1,000,000. The two lower stories are of Indiana limestone.

The Furst-Kerber Cut Stone Company will cut full sized carvings of Ford automobiles to be used for display purposes in the sales rooms of the Ford Company in New York City and Washington. Plaster models of the machines have been made by Donnelly & Ricci, of New York, and shipped to the stone company.

ENTRANCE OF ROWALLAN CASTLE, Ayrshire, Scotland  
Built in 1562 by John Muir, replacing an earlier structure.  
From a drawing by W. G. Allen.

#### Construction Notes

Romolo Botelli, a Newark architect has completed plans for the erection of an apartment house at 107-109 Parker Street, in that city. The building will have limestone trimmings.

Geo. Backer, Emanuel Arnstein and Samuel Levy have filed plans for the construction of a thirteen story apartment hotel on Vanderbilt Avenue, between Forty-eighth and Forty-ninth Streets. The plans have been prepared by Warren and Wetmore, and show façades of limestone, red brick and terra cotta in the style of the English Colonial. The building is to be divided into suites of from two to six rooms with every modern convenience. There are to be extra accommodations provided for help.

Boston's newest theatre, the Fenway, which has been in course of construction for nearly a year, was opened during the past month. It was designed by Thos. W. Lamb, architect, of New York, and the interior is elaborately finished in Italian marble.

Eight bids were received on the second call for the construction of the new jail at Jersey City. The lowest bid was from W. H. & F. W. Cane, of New York, and amounted to \$861,665, for Concord granite.

The Citizens' First National Bank of Albany, Ga., will erect a seven story office and bank building after plans by E. Ten Eyck Brown, of Atlanta.

The Baptist Orphanage at Hopeville, Ga., will erect a dormitory with stone trimming, after plans by John C. Battle, Atlanta.

It is announced that the Savannah Sugar Refining Company will erect a \$3,000,000 refinery, at Savannah, Ga.

The contract for the erection of the new county court house at Pontotoc, Mass., has been awarded to Dobson & Olive, Birmingham, Ala.

The Bridgeport Savings Bank will erect a \$200,000 banking building at Bridgeport, Conn., after plans by Cass Gilbert, New York.

Monmouth County, N. J., will erect a new three-story court house after plans by Warren H. Conover, New York.

St. Joseph, Missouri, will erect a two-story museum, after plans by Walter Boschen, of that city.

Howard L. Beck, of Buffalo, N. Y., is preparing plans for a new school for that city to cost about \$137,000.

The Greenwich Trust Company, of Greenwich, N. Y., is

hotel for the Gillsy Hotel Company, at Cleveland, Ohio. The architect is George F. Hammond, of that city.

The Ottumwa Hotel Company will erect a \$250,000 hotel and store building at Ottumwa, Iowa, after plans by Proudfoot, Bird & Rawson, of that city.

Holy Trinity Roman Catholic Church of Westfield, N. J., will erect a new school and church building, after plans by Elliott Lynch, New York.

Bids will soon be taken for a three-story high-school at Erie, Pa., costing \$300,000. The plans are by Wm. B. Ittner, St. Louis, Mo.

The Holy Rosary Roman Catholic Congregation of Dayton, Ohio, will erect a \$100,000 church, after plans by W. L. Jaekle, of that city.

The Ashland Methodist Episcopal Church, of Ashland, Ky., contemplates the erection of \$75,000 church and Sunday school in the spring. The plans are by V. T. Ritter, Huntington, W. Va.

Bids will be received until January 31st, for a \$100,000 school building at Windsor, Ontario. Architect, Jas. Pennington, of that city.

### Foreign Trade Opportunities

Further particulars concerning the following paragraphs can be had by addressing the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., using the reference number given in each instance:

A business man in Denmark announces that he is desirous of corresponding with firms operating their own quarries, and which manufacture and sell all grades of slate. Correspondence may be in English. Number 19611.

A report from an American consular officer in South Africa gives name and address of an owner of a mica mine who is desirous of corresponding with persons interested in financing such a proposition. The claims run east and west and are 4,500 feet by 600 feet. The five shafts are 6 feet by 4 feet inside of the timbers. It is stated that a large number of trenches are open, exposing from 5 to 7 inches of mica. No. 19477.

A firm in Italy informs an American consular officer that it desires to secure agencies for the sale of tombstones and other works in marble. Correspondence may be in English, French or Italian. No. 19479.

### Appreciation

To the Publishers of STONE:

Please enter our order for 1916 subscription to STONE Magazine; this to be sent to the Builders' Association of Kansas City, with bill to us. This is in the nature of a contribution to their Reading Room, and we hope it will start others along the same line. As we want to start out with the best, we are giving them STONE Magazine.

PHENIX MARBLE COMPANY.

### Obituary Notes

Thos. Royle, one of the best known stone dealers in the western part of New Jersey, died during the past month at his home in Trenton, N. J. He was 72 years of age. He served with distinction in the Civil War and was badly wounded at the capture of Richmond. He was the last of a family of 18 children.

The recent death is announced of George Simpson, one of the leading granite manufacturers of Aberdeen. Mr. Simpson was born in Scotland, but after completing his apprenticeship, came to this country and was engaged cutting granite for the piers of the Brooklyn Bridge. Shortly thereafter, he returned to Scotland and established a granite business in connection with his brothers.

### CHURCH OF THE TEMPLARS AT LAON, FRANCE

The remarkable corbel table has been figured in Viollet-le-Duc From a sketch by J. Tavenor Perry in the London Architect

requesting competitive plans for a new three-story banking building to cost \$200,000.

Bids will soon be required for a new court house and jail at Wilmington, Ohio, to cost about \$300,000. The architects are Weber, Werner & Adkins, 1206 Mercantile Library Building, Cincinnati, Ohio.

Elmer E. Dunlap, of Indianapolis, is preparing plans for a \$200,000 court house for Carroll County, to be erected at Delphi, Ind.

Bids will be taken this month for a \$90,000 school at Rochester, N. Y., the plans for which have been prepared by Gordon & Madden, of that city.

The Lorain County Banking Company contemplates the erection of a ten-story office and banking building at Elyria, Ohio, to cost \$250,000. The architects are Walker & Weeks, Cleveland.

Peru, Ind., will erect a three-story city hall, after plans by Schrieber & Beelman, Toledo, Ohio.

The Bartlett Bros. Land and Loan Association, of St. Joseph, Mo., will erect a \$200,000 bank and office building.

The Southern Hotel Company will erect a ten-story hotel costing \$250,000, at Baltimore, after plans by Otto G. Simonson, of that city.

St. Mary's Roman Catholic Church, of Rutherford, N. J., ask for competitive designs for a new parochial school.

Bids will be received about March 1st, for a ten-story



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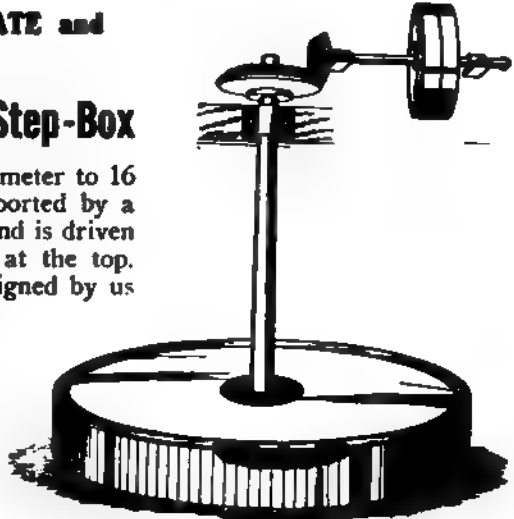
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## Chain and Hoisting Gear for Stonework



THE country-wide campaign for "safety first" and the enactment by various states of stringent compensation laws makes it of prime importance that all quarrymen and stoneworkers should give the closest attention to all matters of equipment. Inasmuch as the stone trade requires the constant handling of extremely heavy masses, hoisting apparatus and attachments must be of the best quality and must undergo frequent inspection in order to see that there is no dangerous deterioration. In the list of "Quarry Accidents in the United States," compiled by the Bureau of Mines, there is no specified record of the number of accidents due to the breaking or failure of hoisting apparatus. These may be included under "haulage accidents," which were responsible for 20 deaths and 162 serious injuries during the year 1914. Or they may find a place under "machinery (not including locomotives or drills)," in which the record was 8 deaths and 61 serious injuries during the year 1914. At any rate, every one realizes the importance of the strictest supervision over hoisting apparatus, including ropes, chains, slings, bolts, etc.

The British government exercises close supervision over quarrying and mining operations in that country, and all accidents are investigated by the government as well as by the local authorities. As in this country, there are also frequent government publications giving useful advice and information. The Home Office has recently issued a memorandum by G. S. Taylor, one of the Royal inspectors of factories, dealing with the causes of, and possible means of preventing, accidents arising from the fracture or failure of chains and such metal appliances as rings, hooks, shackles, swivels, etc., used for lifting purposes. While this is very technical and has to do largely with methods of manufacture that are applicable only to conditions in Great Britain, the memorandum also contains much that should interest American stone workers.

Chains, hooks, shackles and other similar appliances for lifting purposes are generally manufactured from either wrought iron or mild steel, except certain special types of chain links for conveyors and elevators, which are made from malleable cast iron, says Mr. Taylor.

The selection of a suitable quality of material is of the utmost importance, and users of chains, especially those employing trained inspecting staffs, are now giving the matter more attention. On the other hand, small users, having no means of testing or sampling, must rely entirely on the maker's trade description. Reputable firms supply chains and tackle of a satisfactory quality, but frequently chains and tackle are either purchased from firms whose prices indicate that the materials cannot be of good quality, or through merchants who rely entirely upon trade descriptions, have little technical knowledge, and naturally sell those goods which yield the greatest profit.

Chains, rings, hooks and other lifting gear are generally made from rolled bar iron, although mild steel is replacing iron to some extent in the manufacture of all these appliances. Iron suitable for lifting chain should be tough and have a silky, fibrous fracture; it should be uniform in quality throughout, be free from "cold" and "red" shortness, grooving and laminations. Further, in the case of chain iron, the bars must be approximately circular in section, otherwise the links will not bear evenly upon each other. The iron must also be of a good welding quality.

Even the highest quality of wrought iron will exhibit a crystalline fracture if this is produced by a load suddenly applied, but this quality of iron will show a fibrous fracture if a bar is broken by bending after being nicked all round, whilst ordinary good iron will exhibit a fibrous fracture if a bar is nicked on one side only and bent back on itself. The presence of small traces of phosphorus (over 0.15 per cent.) causes iron to crack when worked cold ("cold-short"). The presence of a small quantity of sulphur (over 0.015 per cent.) makes the iron brittle and liable to crack when hammered at a red heat ("red-short"). Grooving is caused by bad setting of the rolls when rolling the bars. Lamination is produced by layers of slag and oxide between the fibres of the iron.

A usual specification requires the iron to be of the best smithing quality and able to stand satisfactorily certain bending tests both hot and cold: *e. g.*, that a sample tested to destruction under tension must have

an ultimate tensile strength of not less than 22 nor more than 24 tons per sq. in., an elongation at fracture of 25 per cent. on a gauge length of 8 in., and a reduction in area at the point of fracture of not less than 45 per cent.

Some specifications require chains to be made from certain high-class named brands of iron, whilst others state that the chain must be made of either "best," "double best," "treble best" or other special quality of material. Unfortunately these terms are indefinite and misleading, as the "treble best" iron of some makers is not superior to the "best" iron of others. For instance, five samples of chain were bought on the market with a "certificate of test," and the iron used was found to have ultimate strengths varying from 22 to 27.8 tons per sq. in., and the elongations on gauge lengths of 10 in. varied from 15 to 28 per cent.

Whilst the ultimate tensile strength or breaking strength of a chain material is a very important factor, this must not be considered alone in determining its suitability for the purpose. A chain is subject to shocks, and the metal should be capable of withstanding these without fracture and, provided they are not excessive, it should be sufficiently elastic to recover entirely from the strain produced. These conditions obtain with a material which shows a considerable elongation before fracture, and a marked reduction of area at the point of fracture, when subjected to a tensile test.

Steel for welded chains is of a special welding quality with a low carbon content, produced by the Siemens-Martin process. Such material has an ultimate tensile strength of 25 to 32 tons per square inch, with an elongation of 32 per cent. on a 10-in. test length and a reduction of area of 60 per cent. at the point of fracture. Although steel is generally more uniform in quality than wrought iron, it is said that the uniformity does not extend to its welding property, and in this respect it is more variable than wrought iron. Moreover, steel requires greater care in smithing, and is more liable to injury if improperly heated. Hence mild steel is not generally regarded as suitable material for welded chains, and many authorities do not favor its use even for rings, hooks, shackles, eyebolts or swivels. This objection appears to be relaxing in some quarters, especially as hooks, shackles and swivels are made without welding, and can be cheaply produced by drop forging or stamping.

Crane and sling hooks, rings, shackles, eyebolts and swivels are often hand-forged from wrought iron or mild steel. Smaller sizes of hooks and other lifting appliances are generally forged from the bar, and welded where necessary. Larger sizes of hooks, shackles, eyebolts and swivels are forged from specially selected scrap iron or steel worked up into blooms.

The more modern method of drop stamping or drop forging is now largely employed in the manufacture of hooks, rings, shackles, and eyebolts for moderate loads.

The metal is heated to the requisite forging temperature and then pressed or stamped in a pair of dies under a steam hammer or drop hammer. In some cases a graduated series of dies is used if the metal has to undergo a considerable amount of working, and the article is re-heated before being placed in each of the dies. Drop forgings can be produced more cheaply than hand forgings, and for smaller sizes are considered by some engineers to be superior to hand forgings. This view is supported by some tests of drop-forged crane hooks made by Prof. John Goodman. On the other hand, it is often contended that drop-forgings are frequently made from inferior metal and mixed scrap; that when good metal is used, it may be overheated to secure the necessary fluidity for stamping; also that the skin of the drop-forged articles is liable to be brittle owing to the cooling of the dies. Many firms object to drop-forged appliances for lifting gear, whilst others consider them quite satisfactory.

According to Unwin, the links of a chain should be designed as small as possible, since (i) the greater the number of links in a given length the more flexible is the chain; and (ii) the smaller the transverse dimensions of the link the less the bending action. The ideal chain is impracticable, because the links must be wide enough to allow effective welding, and the radius of curvature at the ends must be greater than the radius of the iron to allow the links to move freely upon each other. It is also found that if the links have slightly oval sides, the chain has greater elasticity, and is better able to withstand severe shocks.

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### Personal

Announcement is made to the trade that Menconi Bros. and Ardolino Bros., architectural sculptors, have formed a partnership under the firm name of Menconi & Ardolino, and will conduct their business at their studios, 206 East Thirty-third Street and 335 West Twenty-fourth Street, New York City.

David L. Stein announces that his son, Sidney L. Stein, has become associated with him in the practice of architecture and that the business will hereafter be conducted under the firm name of David L. Stein & Son, with offices at 405 Valentine Building, Toledo, Ohio.

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### Conditions of the Stone Trade in Great Britain

According to labor reports, the condition of the stone trade in Great Britain is not very satisfactory at present. The depression in North Wales continues, it is reported, although there is a slight improvement in the Festiniog district. The granite trade in the Aberdeen district is dull and much worse than a year ago, but in Leicestershire there was a slight improvement. The limestone trade reports a fair condition. The making of paving blocks, especially in Scotland, is reported as fair, although it was quiet in a few of the districts.

## Church Building in New York



**D**URING the past few years almost the only form of construction that has shown no lack of activity has been church building. Many millions of dollars have been expended on the erection of churches, and these have varied from simple and unpretentious edifices to vast cathedrals. A number of the latter are still in process of erection and will not be completed in years. While too many of the churches have been false to their principles in seeking to make a showy display by the use of materials that are an imitation and a sham, it is pleasant to record that many have been beautiful and dignified structures of honest natural stone.

As usual, New York holds the most important place, both as to past and prospective church building. For several years past the principal activity at the Cathedral of St. John the Divine has not been on the main building itself, but on the chapels surrounding the sanctuary, of which there are to be seven in all, and on the various accessory buildings which now crown the Cathedral Heights, the Synod Hall, the Choir House, and the Bishop's House. What a noble group this makes, even with the Cathedral in its present incomplete form, is well shown by the accompanying striking photograph.

The Cathedral Chapter announces that work will at once be resumed on the great fane itself. The original plans have been somewhat modified under the direction of the recently appointed supervising architect, Ralph Adams Cram. Everything is about ready for beginning construction work on the nave of the Cathedral.

This will cost more than a million dollars, and it is expected to take fully five years to complete. The particulars of this work have already been published.

There has recently been completed the beautiful Dix memorial Chapel at old Trinity. This is a fine structure in brownstone, in harmony with the venerable church itself. It is notable as containing one of the very few examples in this country of a cenotaph with a recumbent figure, that of the Rev. Morgan Dix, long rector of Trinity. The accompanying illustration shows what an artistic and dignified example of stone carving this is. Nothing in the entire city of New York calls out more admiring comment than this beautiful church and its surrounding bit of greenery entirely hemmed in by the great commercial sky scrapers.

This magazine has recently illustrated two very striking examples of church building in New York. One of these is one of the very greatest parish churches in the world, St. Thomas', on Fifth Avenue. When the original church burned down it was determined to erect a new edifice worthy of the rich and liberal congregation that worships here. The great Gothic structure is of oolitic limestone, which lends itself admirably to the elaborate carving and ornamentation.

The other edifice to which reference was made is the Church of the Intercession, a parish chapel modest in dimensions but as rich and artistic in its construction as art can provide. The exterior of this is of Indiana limestone and the interior mainly of Ohio sandstone, two materials which lend themselves admirably to the elaborate ornamentation that was devised. We have

THE PICTURESQUE GROUP OF BUILDINGS ON CATHEDRAL HEIGHTS, NEW YORK  
This bird's-eye view shows the cathedral as far as completed, with the memorial chapels opening from the sanctuary, the Choir House, the Synod Hall, and the Bishop's House

already shown a number of the very beautiful carvings that find a place in this church, and another one is illustrated herewith.

Within a few months work will be begun on another one of the greatest parish churches of the world. This is the new St. Bartholomew's, which will be erected at Park Avenue and Fiftieth Street, taking the place of

made by Mr. Goodhue to preserve the harmony. At the new St. Bartholomew's, as at St. Giles', the portal stands free as the front merely of the narthex, behind which is the wall of the church proper.

The narthex will be seventy-three feet long and fifteen and one-half feet wide. The narthex, or vestibule, will be divided into three bays and ceiled with pendentive domes, and entrance will be through three light double doorways into as many aisles of the church.

The church will be cruciform, although the length of the transept arms will be much less than would have been the case in the past. There will be transept balconies and a series of clerestory galleries the full length of both nave and chancel above the side aisles. The ground floor of the church will seat 1,302 persons.

Large clerestory windows will be in the outer walls behind these passageways, excepting on the north side of the chancel, where there will be three of these windows to each bay. Here will be placed the organs in the present chancel. The great organ, now over the main entrance, will have a like position in the new structure.

A great rose window in the south transept will be reminiscent of such Italian examples as St. Francis at Assisi. The mural painting "The Resurrection," which at present occupies all the space above the altar in the new church will be displayed on the main wall of the other transept. This painting is the work of the late Francis Lathrop.

The main body of the church and the transepts will be 44½ feet wide. They will be covered by barrel vaults. Above the crossing four piers will support four arches upon which will rise the walls that will form the lower story of the ciborium. The best known examples are those of the churches at Santa Maria della Grazie at Milan, and the Cottosa at Pavia. From an octagon will be thrown sixteen smaller arches, from which will rise the columns and arches of a high gallery. Above this will be a semi-circular dome pierced at the apex by a ring from which will rise the cupola.

The exterior of the church will be mainly of Indiana limestone. The exceptions will be the marble shafts of the columns and the architraves and tympana. Most of the wall surface, however, will be of brick of an unusual character and quality, not regular either in size or shape.

### Plans of Sculptor MacMonnies

For many years Frederick W. MacMonnies, the eminent American sculptor, has had studios at Paris and at Giverny-Vernon, near the French capital. Some months ago Mr. MacMonnies returned to this country and has been working in the studio at 108 East Fifty-first Street, New York, occupied until recently by A. Phimister Proctor. The sculptor has just completed a marble fountain, soon to be delivered to the New York

**THE LAWRENCE MEMORIAL DRINKING FOUNTAIN**  
An artistic feature of the Chapel of the Intercession at  
155th St. and Broadway, New York, carved in  
Indiana limestone

the present structure at Madison Avenue and Forty-fourth Street. The plans are by Bertram G. Goodhue, of this city. The new edifice will be Romanesque, of the Italian type, to correspond with the triple portal in the present church, which will be moved and built into the new structure. This portal, which is by McKim, Mead & White, was incorporated some years ago into the present building and is regarded as perhaps the most beautiful of its kind in America.

A unique feature of the entrance is that by a series of inclines the necessity for steps will be obviated. In the design for the new church the triple portal appears as the crux of the whole, and every effort has been

Public Library. He is also working on a fountain for New York City Hall Park, and is preparing studies for the Battle Monument at Princeton, N. J. These things finished, he will follow his own inclinations.

"It is interesting and it is good discipline," said Mr. MacMonnies to a reporter, "to take up the problem which is presented by a large public commission; but, after all, one finds that his ideas in such work are rather circumscribed. It is not well to do one thing all the time.

"First of all, I shall paint. One does not care to announce in advance what he expects to do, but I shall develop some ideas which I have long had in mind. I shall do some sculpture work, but only along

such lines as appeal to me, and none of it is to be in the form of commissions. I shall be working for myself. That is, I shall not consider anything from any other point of view than that of expressing my own ideals. I expect to work in that way for three years."

Mr. MacMonnies was born in Brooklyn in 1863, and began his student life in the atelier of Augustus Saint-Gaudens. Although he has lived and studied so long abroad he is thoroughly American in his temperament and in his conception of art. He is best known in this country for his beautiful and dignified statue of Nathan Hale, in City Hall Park, and for his graceful "Bacchante," which so shocked the sensibilities of Puritanical Boston.

MEMORIAL CENOTAPH, REV. MORGAN DIX, TRINITY CHURCH, NEW YORK

The feature of the new Dix Chapel. Thomas Nash, architect, and Isidore Konti, sculptor, both of New York. Cut in Caen stone by James Gillies & Sons, Inc., Long Island City, N. Y.

# Terra Cotta In Public Buildings

By GEORGE BARNUM



FROM time to time there have come complaints to this magazine from various parts of the country, and all of the same nature. It is said that towns and cities have used a considerable amount of terra cotta and artificial stone in public buildings, and that this material shows such deterioration that it is constantly in need of replacement and repairs. If the intelligent taxpayer will take the trouble to scrutinize the budgets brought before his

builder does concerns only himself and his tenant. If he chooses to waste his money on material that can never be first class, the loss is his alone. But public work comes in a different category. Those who order it are directly responsible to the taxpayer. Above all things, there should be honesty and dignity of construction.

It may be well to consider the causes that have led to the gradual introduction of terra cotta and the various cheap substitutes for natural stone. It is not a simple matter of cost and convenience; it strikes far down into the roots of national characteristics. Whatever we may think of foreign and ancient architectural styles, when a nation is well grounded in culture and has a long history of proud achievements it can be trusted to build honestly, solidly and well. It has past tradition to guide it, and it has the future in mind, as well as the mere passing present. On the other hand, the newer country is apt to develop its material resources more rapidly than its taste and culture. Its riches find expression in showy pretence and over-elaboration. Our country is dotted with preposterous "mansions" that gave shelter to the money kings of a generation or two ago. The owners sought first of all to advertise their wealth in their homes. Our plutocrats do better now, although horrible examples abound in every city. The speculative builders are largely responsible for debauching public taste in building. They have erected apartment houses and private dwellings with no thought in mind save to make the greatest possible show with the least possible expenditure of money. They were not seeking permanent investments and as long as they could turn their money quickly, it meant nothing to them whether their buildings were honestly constructed or durable.

It was the speculative builders that gave the keenest welcome to terra cotta and artificial stone. These materials enabled them to fairly encrust their buildings with elaborate ornamentation that would last until the title deeds could be passed to a credulous and unsuspecting purchaser. It is likely that we shall always have the speculative builder with us, and it is important to learn how we may be able to curb his pernicious activity. Building codes are growing stricter all of the time and will keep him to a certain honesty of construction. He works entirely with borrowed capital, however, and here is the way in which he can best be reached. Why cannot the banks and other lenders learn the lesson that it is a poor investment to place a mortgage on a building that will surely deteriorate steadily and rapidly? Terra cotta and artificial stone, used with a free hand and out of their proper place, grow poorer and more shabby with every year of their

## PORTION OF A TERRA COTTA DOOR JAMB

One of the many failures of the material in a new building under exposure and strain

municipal officers he cannot fail to find many items for "repairs of terra cotta" on the public buildings. If he desires to retain a reputation for intelligence and shrewdness, he will begin to question why such a material as this, showing evident deterioration within a short time after being placed in the wall, continues to find acceptance in public work.

No quality in structural materials, no matter how desirable they may be in themselves, can replace durability, and this especially in work of a public character. The taxpayer has the right to demand, and should demand, that his money shall be expended only for the best material obtainable, without any regard to the fads and fancies of architects and building committees. Cheapness does not mean lower initial cost if there are frequent bills for repairs. Speed of construction counts for nothing if time must be taken for replacements. Elaborate ornamentation is worse than the severest plainness if the supposed enrichments crumble and decay or add any element of weakness to the building. Aside from the question of safety, what the private

existence. Stone and brick last for generations and merely mellow with age.

The example of the multi-millionaire and the ambitious speculative builder cannot but have an effect upon public work. What chance is there for a plain, simple, dignified and honest public building when all around are pretentious mansions and elaborate apartment houses plastered over with cheap and meretricious ornamentations? The average city official argues that public must get the most that is possible for its money, and this means to him plenty of mouldings and enrichments, no matter what their nature may be. His name is likely to go on a bronze panel, and if the work lasts as long as he is a candidate for the votes of his fellow citizens, what need he care for the ultimate fate of the building? Besides, can a public building be less pretentious and showy than a private edifice?

It is impossible to deny that much of the blame for this modern tendency, this striving for mere appearance without regard to quality, must be laid at the doors of the architects. It is only natural that decoration should appeal to the architect as strongly as construction itself. Floating before his mind's eye are visions of garlands and festoons, bosses and finials, playful cupids and sportive dolphins, grim lion's heads and nude maidens that may be goddesses of anything that the beholder fancies. A few architects have worked so long with terra cotta and artificial stone that they grow to think in the line of those materials. It is safe to say, however, that the vast majority of architects would prefer to see the creations of their genius wrought in imperishable stone or marble. When they find that not enough money is available for the purpose they turn to the cheaper and more plastic material. It must not be forgotten, too, that it is far easier to design a building that is striking because of the employment of ornamentation than from the skilful arrangement of mass and the dignity of line.

Doubtless architects justify their use of terra cotta by the practices of the master builders of the Middle Ages. If they would take pattern after such restrained use, there would be little cause for complaint. These ancient craftsmen generally confined their terra cotta ornamentation to panels that were protected from the weather by a framing of natural stone, or to such medallions as are the glory of the family of Della Robbia. But once the modern designer works through the medium of baked clay, he is constantly tempted to go further and further. He is no longer contented with panels and medallions, which are a perfectly legitimate use of this material, but must turn molded belt courses, entire cornices and even the plain wall spaces into terra cotta. It should need no argument to prove that stone ashlar masonry can never be satisfactorily replaced by baked clay, except in so far as small and well made brick may be employed. Clay warps and shrinks in the baking, and a wall laid up in terra cotta will have beds and joints from half to three-quar-

ters of an inch in width. These may pass muster at first, but as the mortar crumbles and weathers out the wall becomes an eyesore. There is another point that

WINDOW JAMB IN TERRA COTTA  
A striking illustration of the failure of the material in a Cleveland building, two years after erection

should be kept in mind. Owing to its plasticity, terra cotta tempts to bolder relief than would be cut in natural stone. There are innumerable crevices that give



lodgment to moisture and snow. Under the severities of our climate, the material is certain to crack and spall. This magazine has recorded innumerable instances of sections of terra cotta ornamentation falling to the sidewalk from high buildings, to the manifest danger of pedestrians. This is a menace that grows more serious with the passing of every day.

There is still another arraignment to be brought against terra cotta. The material has little tensile strength or compressive resistance. It is absolutely unfitted to withstand stress or strain. And yet how often do we see it used for sills and lintels and door

pair the integrity of the building itself, except as far as the mere appearance is concerned. But there is one use of terra cotta that cannot be sufficiently condemned from the standpoint of the owner of the building, and that is, as a coping. The purpose of a coping is, of course, to protect the wall that it caps from the weather. Inasmuch as it is impossible to make terra cotta with close joints, the effort has been made to overcome the difficulty by overlapping joints. This avails nothing. A striking illustration was given in these columns two or three months ago of the terra cotta coping on the Chicago City Hall. Almost every one of the overlapping lugs had broken away, leaving wide joints that gave free access to the moisture. In one of the largest and most important buildings in New York, two or three years ago, it was found necessary to remove all the terra cotta coping and replace it with copper flashings, as the moisture was constantly seeping down the walls and penetrating to the upper rooms.

Has not this country reached a stage of wealth and refinement when it can demand honesty, dignity and durability in its public buildings? There should be awakened a general sentiment that will put an end to all tawdry imitations and shams, and that will relegate cheap and inferior materials to their proper place. If our architecture is showy and pretentious at the expense of honesty, what is the world likely to think of our national characteristics, our statesmanship and our diplomacy?

### The Arlington Memorial

In 1913 Congress appropriated \$750,000 with which to build a memorial to the nation's soldiers and sailors. The work was placed in the hands of a commission of national importance. The site selected was in Arlington cemetery—the famous burying ground across the Potomac from Washington, which was once a part of Gen. Robert E. Lee's estate.

Among the Arlington hills of Virginia, looking down on the broad line of the river, George Washington Parke Custis built a mansion and encircled it with parks and gardens. Later Custis' daughter having become the wife of General Lee, the estate also passed into the hands of the man who was to play so large a part in the nation's history. With the close of the war came the transfer of the property to the Federal Government and its adoption as a national soldier's cemetery. It was imperative that there should be some place near Washington where the heroes of both the blue and the gray might be laid at rest. Arlington Heights was the natural choice, says an exchange. There, wrapped in the quiet of the hills, could be grouped the sepulchers of the famous generals and of the unknown but none the less famous men who served under them.

In no other section of the country could a gigantic memorial to our soldiers and sailors have a more ap-

#### TERRA COTTA WINDOW CAP

Cracks that have developed in comparatively new material even when there is no special strain or exposure to the weather

and window jambs? What wonder that it cracks and chips almost before the builders' scaffolding has been removed. If there is one thing more than another that the experience of the ages has proved it is that natural stone is the only suitable material for those portions of a building that are most exposed to weather and to strain.

While the spalling off of ornamentation may endanger the public in the streets, it does not necessarily in-

propriate setting. It will rise in the midst of some 16,000 graves. It will guard the tombs of Custis and his wife, the last members of the Washington family. Within sight of its stately columns will sleep the noted leaders of many wars.

The vast Arlington amphitheatre, as designed by Carrere & Hastings, of New York, will cover about 60,000 feet of space, the length being 260 feet and the width 236 feet. The elliptical colonnade will contain more than 100 massive columns. Within the oval there will be seats for 60,000 persons. Beneath the colonnade, stretching out in either direction from the speaker's forum, a series of crypts will be constructed wherein may be buried the noted men of the army and the navy. The spacious structure at the entrance will be used for a mortuary chapel and military museum. Its walls will be lined with priceless relics gleaned from many battle fields.

This great national monument—the largest memorial on record—is being built of Vermont marble. More than 450 carloads will be required to complete it. The cornerstone of the Arlington was laid on October 13 by President Wilson, the principal address being made by Secretary Daniels of the Navy Department.

### Use of Explosives in British Quarries

The quarrying industry in Great Britain, it is well known, is under strict governmental supervision and regulation. Among the restrictions that are imposed is one that forbids the use of any except "permitted explosives," i. e., those in which the formula is filed with the Government and has been approved. It is interesting to learn the proportion of high explosives used in the British quarries to the low explosives. The report of the quarry inspectors for the district including Lancashire, North Wales, and Ireland, an important district embracing no less than 1,372 quarries, includ-

ing all of the Welsh slate quarries, shows that there was used during 1914, a total of 1,210,699 lbs. of explosives. Out of this total, the amount of gunpowder used was no less than 983,964 lbs., leaving only 226,735 lbs. divided among 28 different high explosives. If the record had included the quarries producing crushed

### HALL IN THE NEW CLEVELAND ART MUSEUM

Finished in Sandstone from the quarries of the Cleveland Stone Company at North Amherst, Ohio

stone and ballast, the showing would have been far different, but for slate and dimension stone, high explosives must always find limited use.

### Marble in South America

Next to the United States, South America is one of the largest users of Italian marble, and its demand for the material is constantly growing. The leading cities of Argentine and Brazil are rapidly increasing in wealth and population, and many elaborate and costly structures are erected. An attempt has been made to find a market for Spanish marble, but it is found that this cannot compete with the Italian and the latter retains its popularity. In Brazil, the marble is sold in slabs ranging from 0.78 in. to 1.56 in. in thickness. The block marble sells from \$360.00 to \$390.00 per cubic meter, which is the equivalent of 1.3 cubic yards. The Spanish Consul at Montivideo says that the importation of Italian marble into the Republic of Uruguay is 2,500 to 3,000 metric tons yearly. The import duties are about \$10.00 per metric ton.



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PERHAPS one of the most peculiar cases that has recently come before the press is reported from one of the Southern States. A shrewd man sold a monument to a widow, erected it over the grave of her deceased husband, collected the money and then decamped. It was found on examination that this clever individual had merely removed a monument from another lot in the same cemetery and used it to fill his order.

IN the newspaper account of a monumental convention in the Middle West, it is announced that it is planned at the meeting next year to "enliven" the lobby of the hotel where the convention will be held with samples of the work of its members in tombstone masonry. "Enliven" would seem the most peculiar word to use in this connection. Tombstones may be beautiful and artistic, but it scarcely would occur to anyone to describe them as lively.

ARRANGEMENTS have been made by a number of exhibitors of building material at the Panama-Pacific Exposition to establish a permanent exhibit of their products in San Francisco. This is a movement in the right direction. There should be a permanent exhibit of building and decorative stone in every important city. It is impossible for architects to carry a complete line of samples in their offices, and naturally they are inclined to use the materials with which they are most familiar. Color effects make a special appeal to them in these days when polychromy is taking an ever increasing part of architecture. If architects had convenient access to some well-arranged and attractive display of stone samples, it is scarcely to be doubted that there would be a greater diversity in the use of building materials. One reason that explains the use of artificial substitutes is that architects are in search of particular color effects and the possibilities of arti-

ficial stone in this way are constantly brought to their attention. Many of them would be glad to use the natural quarry product if they were aware that the same effects could be obtained at very little, if any, extra cost.

THE advertising matter put forth on behalf of a new form of artificial building material states that it will not absorb over 3 per cent. moisture, making it probably one of the least absorbent forms of construction on the market today. Three per cent. of absorption can scarcely be called low, especially for a material that is made by man and has not been welded by the process of nature through the course of many centuries. There are few natural stones that are as porous as this, and most of those that have as large a percentage of absorption have open pore spaces so that the moisture rapidly evaporates and is not a source of danger to the integrity of the stone. Let one examine the tests of various standard natural stones on the market and he will find the ratio of absorption given in such figures as .003, .006, .048 and the like. Promoters will have to find a stronger argument in favor of any artificial material than the statement that its ratio of absorption is only three per cent.

THE International Granite Cutters' Association has entered a protest at Washington against the recent regulations adopted by the Treasury Department, fixing the style of post-office buildings on the basis of the postal receipts in the cities where they are erected. The granite cutters claim that this is a discrimination against the material in which they work. The regulations, they declare, say that granite or marble will be used only in offices where the income is \$800,000 or more a year, and of the thirty-five such offices in the country, those of Boston and Providence are the only two in New England. The cutters say that in the past there have been hundreds of buildings erected of granite even in cities of Class C incomes, and they ask that the Treasury Department be induced to liberalize its order. Few people expected that this order would be rigidly enforced in every case, but the size and cost of public buildings must bear some proportion to the population and business of the community.

A CIRCULAR issued in advocacy of the use of hydrated lime for the purpose of waterproofing cement, mortars and concretes, has this pregnant statement: "One point should be borne in mind by the building contractors and that is 'no waterproofing material will compensate for improperly proportioned aggregate and poor workmanship in the laying of concrete, and that the aggregate should be as carefully selected as the cement and waterproofing material.'" The best way out of the difficulty is to use Nature's choicest material, natural stone, where the mixing of the aggregates and the proper waterproofing has been carefully attended to

centuries in advance. Still another argument advanced on behalf of artificial work is the following: "Moulded cement is unique in that it improves with age. It is said that the hardening process in the cement walls goes on for some twenty-five years after the house is finished, so that a cement house becomes stronger and harder as it grows old. It is impossible to deny that the mass of cement does often grow harder with age, but what does the owner of a building care if the body of the walls is sound, while the surfaces show millions of superficial cracks, scaling and disintegration of ornamentation and constant efflorescence and staining.

A TECHNICAL journal that is constantly advocating the use of artificial materials of construction in a recent number discusses the frequent causes for the failure of concrete. It frankly admits that the material does fail under many circumstances and it enumerates no fewer than fourteen separate and distinct reasons for failure in the mixing of the material. In addition to this, it takes up the disaster that frequently attends the construction of reinforced concrete structures and enumerates no less than eight causes. It should be borne in mind that this has nothing to do with exceptional cases, for the article distinctly says that these are "common causes of failure" or that the "disaster is generally due to one or more off the following causes." It must be remembered that this is not the enumeration made by an opponent of the material but by an earnest advocate of concrete construction. Here, then, are listed no less than twenty-two frequent sources of danger. There are many and potent arguments against concrete, and the only arguments that can be set against them in favor of the material are moderate first cost and speed of construction. The first argument loses much of its weight when it is remembered that there can be no economy in first cost if the structure does not have long life or needs frequent repairs. As a matter of fact, there is scarcely any economy in the use of artificial material of construction over natural stone if suitable provisions are to be taken to provide first-class workmanship. It would be impossible for the most captious critic to advance two valid objections against natural stone. It is difficult to understand why architects, owners and builders will consent to the employment of a material against which can be brought such an imposing array of fact and argument.

### The Death of Harry Hems

One of the oldest, staunchest and most faithful friends of this magazine has just passed away, full of years and of honors. This is Harry Hems, of Exeter, England. Mr. Hems was a steadfast reader of *STONE* from its foundation, and was a frequent and valued contributor to its columns. He died on January 5 at his residence, Fair Park, Longbrook Street, Exeter,

after a long illness, although he had been confined to his bed for a few weeks only.

Harry Hems was, perhaps, the foremost ecclesiastical sculptor of his time in the world. But he was more than this. He was one of the few in modern times in whom the spirit of ancient craftsmanship was potent and illuminating. No one could deny to him strong British characteristics, and yet few of his race were more cosmopolitan or broader in sympathy. He was an indefatigable traveler, and was thoroughly familiar with the leading cities of Europe, America, North and South Africa and Asia. It is safe to say that in every country he visited he made warm and loyal friends to whom the news of his death will come with a sense of poignant loss. The most marked characteristics of the man were his indomitable energy, his unflinching humor and the catholicity of his tastes and sympathies. He was a firm believer in the value of publicity, and few men contributed more constantly to the press. Some years ago he added to his voluminous scrap-book the ten thousandth article signed with his name or relating to his manifold activities. It is only fair to say, however, that the great mass of his contributions to the newspapers and the technical press was made up of generous tributes to the work of others, or of appreciations of the progress made in countries he had visited. He never tired of telling of the marvellous advances in architecture, engineering and science he had witnessed in America.

Mr. Hems was born in London in 1842 of a long line of cutlers. He was early apprenticed to the cutlery trade, but showed a greater fondness for using knives for carving than for forging and finishing them. So pronounced was his penchant that he was fortunately placed with the foremost wood-carver of his day and learned this trade. In early youth he went to Italy to study the old masters, and at Carrara and Florence he learned the art of carving marble. A better training than this could scarcely be imagined to fit one for making ecclesiastical decorations. In 1866 he established himself in Exeter, and in the course of a few years his studio made a name and reputation for itself all over the world. He was engaged for the restoration of famous English churches, and his carvings in wood and stone found place in great Christian fanes of several continents. Perhaps his most noteworthy work was the restoration of the high altar screen at St. Alban's Abbey, admittedly the finest fifteenth century structure of stone in the world. Not only did he restore the fabric generally, but he filled over one hundred vacant niches with statues. From his studio also came the magnificent reredos and altar for the Cathedral at St. Louis, the most elaborate and beautiful ecclesiastical sculpture on this continent, which Mr. Hems installed in person on the occasion of his last visit to America. He also won the highest awards for his exhibits at the international expositions at Philadelphia and Chicago.

No sketch of the life of Mr. Hems would be complete without a reference to his personal activities. For 40 years he served on the boards of the Exeter hospitals and was a constant and cheering visitor of the inmates. Every Christmas he entertained at his studios the poor and broken citizens of Exeter, one guest for each year of his life. This beautiful benefaction continued until 1914, when it was dropped because of the ill health of the donor. The world is distinctly poorer from the death of Harry Hems.

### What Are "Extinct" Marbles

In the entire field of trade literature, few things are more remarkable and amusing than the announcements put forth on behalf of the various manufacturers of artificial stone and marble. Of course, it is always claimed that the artificial material is superior in durability to the natural product and that it cannot be told from the latter except by an expert. Credulous investors must believe these assertions or else they would scarcely be made so constantly. The general public, which sees how these cheap shams crack, discolor and lose all of their freshness within the course of a year or two, know what weight to give to these extravagant claims. But in addition to such statements, the promoters are not content unless they can exhibit in some way their familiarity with the natural product. In order to show the possible market for their imitations they will multiply manifold the cost price of the natural stone and then will declare that something even superior can be had for a quarter or one-tenth of the cost. Perhaps the most remarkable statement of this kind is made in the prospectus of a maker of artificial marble in the Middle West. It is solemnly declared that marbles that have been extinct for centuries are reproduced by this process. One would like to ask just what an extinct marble is. In Greece and Rome are still to be found magnificent architectural examples of marbles that were used before the dawning of the Christian Era. These still charm every intelligent beholder with their beauty, age having merely mellowed their tones. The quarries from which most of these marbles were taken are known and are still worked, if the demand warrants.

Rosso Antico, for example, one of the most famous marbles of antiquity, has been used within the past few years in a notable new building in this country. The red and yellow marbles of Numidia, from which came some of the choicest decorations of Imperial Rome, are largely used in these days in countries that were never dreamed of when the quarries were operated. The identical quarries in Numidia from which the workmen of Augustus Caesar took their blocks were reopened a quarter of a century ago by American operators who found countless interesting records and relics of the Roman workmen. The quarries on the Island of Euboea which produced the Greek

Cipillino, another favorite marble of the Roman architects and builders, after having been lost for 2,000 years, were rediscovered two or three decades ago, and are now in active operation once more. New York is still drawing freely from the ancient Travertine quarries, at Tivoli, Italy, from which the Colosseum at Rome was built. The great quarries in the Apuan Alps at Carrara, Massa and Pietrosanta have been worked continually since before the time of Christ. The Normandy quarries, that yield Caen stone, have also been producing their blocks for buildings in many countries, for more than a thousand years. Certainly none of these marbles or stones are "extinct," in any sense of the term. There are many stones used for building and decoration that have had constant use for many centuries. Only a few stones once popular have dropped out of favor and that is because something superior has been found to take their place.

### Death of a Veteran Stone Man

One of the oldest stone cutters in the United States and a man who was prominently identified with the stone industry in New York for many years, died during the past month. This was Mr. G. N. Williams, the founder of the leading firm of cut stone contractors, B. A. & G. N. Williams. Mr. Williams was a farmer lad and was born in Connecticut in June, 1827. During his youth he worked on his father's farm, but between crops had occasional jobs in getting out bluestone. In 1849, he came to New York with a load of feldspar. While waiting to find a market for his product he got a job as a stone cutter with the Empire Stone Works, a large concern for those days, employing about four hundred men, mostly French. The work was then largely in Connecticut brownstone. In 1854, Mr. Williams went into business for himself, and a few years later, took his brother into partnership, under the firm name of G. N. & N. A. Williams. The first large contract was the old Fifth Avenue Hotel, every part of the stone work in which was laid out by Mr. Williams' own hands. It was built of marble from South Canaan, Conn., and the stone was sawed by water power at a mill near the quarry. Mr. Williams continued in active control of the business until 1871, although he retained his interest in it for many years later. In 1871 Mr. B. A. Williams, a nephew, was taken into the partnership and the firm name became B. A. & G. N. Williams. About 1880, Mr. G. M. Williams, Jr., a son of the original founder, was associated with the business, and the firm name was then changed to B. A. & G. N. Williams, Jr. In 1898 the company was incorporated under the name of B. A. & G. N. Williams, a name which it has since retained. One of the officers of this company is Arthur D. Williams, a son of the original founder. Mr. Williams was widely known throughout the trade and was greatly esteemed for his integrity and sterling character.

### New Interests in Vermont Marble

There was incorporated in Boston the last of January the United States Marble Company, of that city, with a capital of \$6,000,000. The corporation is authorized to do a general quarrying business. Its directors are Perley R. Eaton, Maurice J. Cashman and Abbott S. Pond. Only three shares of stock are to be paid for in cash. The stock has a par value of \$100 per share.

The announcement of the formation of this new concern was made at the annual meeting of the Green Mountain Marble Company, held in Rutland on January 25. Mr. Eaton is of Fitchbury and Messrs. Cashman and Pond of Boston.

A Rutland correspondent writes as follows: "Mr. Eaton, who has been prominently identified with many big interests, lumber in addition to marble, will be president of the new company, and will devote his entire time to this enterprise.

"This corporation immediately succeeds both the Green Mountain Marble Company and the Columbian Corporation, which companies cease to exist, and as fast as the details can be arranged other companies will be consolidated under the general ownership and direction of the new company.

"The financing of the new corporation has been affected by Mr. Pond, a former resident of Rutland, for and in the interests of his banking firm, Hodgdon, Cashman & Co., of Boston. The financial resources of the new company will be made entirely ample to carry out the extensive project, the Boston firm being one of the most substantial in the country. This banking house in past years has handled many large industrial underwritings, being specialists in Massachusetts corporations and at present the largest house of their kind in New England.

### Mr. Schwab's New Home in Loretto

Mr. Charles M. Schwab, head of the Bethlehem Steel Company, will build an elaborate new home at Loretto, Pa. It is expected that the house alone will cost fully \$250,000. It will be surrounded by an artificial landscape for which he expects to pay \$350,000. There will be a huge open Roman bath at the edge of a glassed terrace near the house. From it a cascade will fall to a pool in sunken Italian gardens 200 feet away. The house will be of steel construction, faced with stone, with foundations of granite. There will be elaborate marble work in the gardens. Elaborate retaining walls will have to be built, but an effort will be made to cover these with foliage.

### Pennsylvania Monument Men

The Eighth Annual Convention of the Retail Marble and Granite Dealers' Association of Pennsylvania, was held at the Hotel Adelphia, in Philadelphia, Pa., the past month. Various addresses were made and a banquet held. The officers of the association are: President, R. H. Koontz, Greensburg, Pa.; vice-president, J. M. Gessler, Philadelphia; secretary, A. H. Luckenbill, Middletown, Pa.; treasurer,

M. H. Curry, Meadville, Pa. Executive committee: John E. Miller, Wilkesbarre, Pa.; M. R. Johnson, Bellefonte, Pa.; P. F. Gallagher, Philadelphia. Freight committee: E. A. McColly, Latrobe, Pa.; W. L. Messinger, Steelton, Pa.; R. R. Bigelow, Philipsburg, Pa.

### Nebraska Monument Men in Session

The Marble & Granite Dealers of Nebraska held their annual meeting in Lincoln, the past month. The following officers were elected: President, Gid Auringer, of Neligh; vice-president, E. Bergman, of Columbus; executive committee, F. L. Kimball, of Lincoln; Charles Neihart, of Beatrice, and Frank Moon, of Fairbury. A committee, consisting of Al Bloom, of Omaha; Frank Moon, of Fairbury, and F. L. Kimball, of Lincoln, was appointed to go before the next legislature and try to secure the passage of two measures, one to permit the marble and granite men to attach a lien on unpaid monuments, and the other to permit the erection of community mausoleums.

### The Hours of Granite Cutters

The *Granite Cutters' Journal* calls attention to the fact "that after the springtime of 1916 the minimum wage rate for members of this association (Granite Cutters' International Association) will be not less than \$4 per day of eight hours, and that agreements with five working hours instead of four on Saturdays will be changed not later than the above date to four working hours on Saturday."

### New Companies

The Wisconsin Crushed Stone Association, of Milwaukee, Wis., to further the business of manufacturing and selling crushed stone. Incorporators, A. J. Blair, W. M. Spooner, and L. D. Smith.

Marchesini & Despirt, Inc., of Buffalo, to manufacture marbles, mosaics, terrazzo, etc. Capital, \$30,000. Incorporators, E. Marchesini, G. and E. Despirt, 112 Church Street, Buffalo, N. Y.

The Southwestern Gravel Company, of Ardmore, Okla., to deal in gravel, crushed stone, etc. Capital, \$50,000. Incorporators, James A. Cotner, Ardmore, Okla., A. H. Cotner, Geo. Cotner, Colorado Springs, Colo.

The Slaughter-Thompson Company, of South Bend, Indiana, to manufacture marble and granite monuments. Capital, \$30,000. Directors, Leon B. Slaughter, Bruce W. Thompson, K. M. Slaughter.

The Norcross-Reynolds Mausoleum & Construction Company, of Worcesetr, to build mausoleums and to do general construction work. Capital, \$250,000. Incorporators, Orlando W. Norcross, Chas. F. Morgan, Albert J. Park.

The Blanchard Stone Company, of Kenton, Ohio, to quarry, crush and sell stone, etc. Capital, \$35,000. Incorporators, Wm. H. Sharp, Alexander H. Johnson, and J. M. Schooler.

The Southwestern Stone & Lime Company, of Bradford, Va., to quarry and manufacture stone and lime, etc. Capital, \$100,000. Officers: A. E. Carper, president; W. W. McElrath, vice-president; J. A. McElmore, secretary and treasurer, all of East Radford, Va.

The Morrill Cut Stone Company, of Bedford, Indiana, to manufacture and sell stone. Capital, \$50,000. Directors, B. F. Morrill, H. M. Gillman, Jr., R. L. Mellen.

The Ideal Sand & Gravel Company, of Mason City, Iowa, to sell sand, crushed rock and building stone. Capital, \$150,000. Incorporators, F. A. Stephenson, Grant McGooan and M. W. Stephenson.

A. Miller & Sons, Summit Grove, Indiana, to deal in sand, stone, etc. Capital, \$20,000. Directors, Albert Miller, E. L. Mack and M. G. Miller.

The Mogadore Sand & Gravel Company, of Cleveland, Ohio, to deal in sand, stone, etc. Capital, \$10,000. Incorporators, A. S. Cunningham, C. Emerson A. H. Keehl, Agnes F. Keehl, and H. V. Tilkins.

The United Tile & Marble Company, of Newark, N. J., to manufacture tiles, marble, etc. Capital, \$50,000. Incorporators, Rosa Tabolsky, Samuel Tabolsky, Newark, William Newman, Harrison, N. J.

The Evergreen Slate Company, of Whitehall, N. Y., to manufacture roofing slate and conduct a general quarrying business in Vermont, and elsewhere. Capital, \$6,000. Incorporators, W. Starr, J. G. Burbett, G. H. Hyatt, of Whitehall.

The Mausoleum Construction Company, of New York, to construct mausoleums, vaults, etc. Capital, \$125,000. Incorporators, R. C. Hull, W. E. Roche, F. I. Quick, 200 5th Avenue, New York City.

The National Pumice Stone Company, of Brooklyn, New York, to import and export pumice stone. Capital, \$1,000. Incorporators, W. Walter Yule, Gordon W. Hoffman, Arthur L. Hurley, Brooklyn.

Monson Lustre Slate Company, of Portland, Ore., to manufacture and deal in slate. Capital, \$100,000.

The Meadowbrook Marble Company, of Boston, Mass., to quarry and deal in marble. Capital, \$300,000. Incorporators, Alton F. Tupper, Daniel J. Shea, Fred E. Houghton.

The Ogdensburg Limestone Products Company, Inc., of Ogdensburg, N. Y., to quarry and deal in stone, etc. Capital, \$10,000. Incorporators, W. T. Davis, N. T. Lovejoy and J. T. Dunne.

The Lyndon Sand & Gravel Company, of Syracuse, N. Y., to deal in sand, stone, etc. Capital, \$15,000. Incorporators, Francis L. Wirth, Wm. E. Chetwin, A. J. Vroman, Jr., Earl R. Vroman and Robert C. Vroman.

The National Trap Rock Company, of Hartford, Connecticut, to quarry and sell crushed stone. Capital stock \$250,000. Incorporators, Jas. L. Warner, of Rocky Hill, Howard M. Steele, of New Britain, and Harry R. Capen, of Hartford.

The Berton Holding Company, of New York City, to deal in building stone, to do construction work, etc. Capital, \$10,000. Incorporators, Alice Berton, Saturno Belladonna, Peter La Spina, Manhattan.

The Paducah Marble Works, Inc., of Paducah, Ky., to manufacture and sell marble. Capital, \$25,000. Incorporators, J. E. Williamson, H. F. Williamson, and W. D. Stuart.

The Queen City Crushed Stone & Sand Company, of Cincinnati, Ohio, to deal in and manufacture crushed stone and sand. Capital, \$50,000. Incorporators, Jas. M. Sprague, Harvey T. Stinson, Thos. F. Groves, Joseph Ertel and Orville K. Jones. The company will conduct a plant near Remington, on the Pennsylvania lines.

The Casas Lime and Stone Company, of Cleveland, Ohio, to quarry stone and manufacture lime, etc. Capital, \$10,000. Incorporators, R. G. Sweatland, F. L. Swetland, M. G. Theobald, R. Messenger and T. E. Deighton.

### Quarry Notes

Kansas City, Missouri, has just re-opened its Municipal rock quarry, at Fifth Street and Swope Parkway. This is used to give employment to applicants at the municipal lodging house.

The General Stone Crushing Plant of Easton, Pa., has taken over control of the big stone crushing plant in Little Falls, N. Y., formerly operated by the John Peirre Company. This plant has been idle for several years and will resume operations at once with G. L. Hancock of West Virginia, in charge.

The State Board of Control of Iowa, has received a report from Warden C. C. McClaughey, of the Anamosa Re-

formatory, recommending that the prisoners be used to quarry the extensive rock deposits at that place. The Board has in mind the purchase of rock quarries and using prison labor in producing crushed stone for road building.

Residents of the vicinity of Somerville, N. J., have entered complaint against the Bound Brook Stone Crushing Company, claiming that heavy blasts at the quarry at Chimney Rock are a menace to public safety.

The Indiana Crushed Stone Dealers' Association held its annual meeting at Indianapolis, during the past month. About 60 members were present.

The Wisconsin Crushed Stone Association, recently formed, has organized, by the election of A. J. Blair, Milwaukee, president; J. J. Sloan, Red Granite, Wis., vice-president; Leatham D. Smith, Sturgeon Bay, secretary and treasurer. There are thirty-eight crushed stone operators represented in the membership, which is all but four of those in the state.

The City of Duluth, Minn., operated its rock crushing plant at the Point of Rocks quarry near that city during last year at a loss of more than \$5,000. The Public Works Commissioner thinks that he will be able to operate it the coming year at a profit.

A new county quarry and crushing plant will be put in operation in a few days at Utah Hot Springs, near Ogden, Utah.

A crushed stone quarry in the Orange Mountains, N. J., is hauling its products by a motor truck. The road leading to the quarry has a grade of more than 12 per cent., and is known as one of the test hills for automobiles around New York. The motor truck has no difficulty, it is declared, in negotiating the steep grades.

The Storm King Stone Company has concluded its evidence in the case of the action brought by the County of Orange to condemn its property for highway purposes. The company introduced testimony to the effect that it discontinued quarrying operations, and the equipment of its plant, because it had been given to understand that condemnation proceedings would be undertaken, and not because of any inability to meet competition.

The Rensselaer Stone Company, which has quarries between Brainard Station and East Nassau, has made arrangements with the Albany Southern Railroad to obtain power to operate crushers and other machinery.

One of the largest stone crushing plants in the southwest is located at Williford, ten miles south of Hardy, Arkansas. A single blast at the quarry a few days ago brought down from 300 to 500 carloads of rock.

About 200 foreigners, mostly Italians, employed in the Kelleys Island Lime & Transportation Company, of Cleveland, Ohio, on Kelleys Island, struck for an increase in pay recently. The company asserts that it has all of the material on hand that it will require for some time to come.

The Leatham & Smith Company have remodelled their crushed stone plant at Sturgeon Bay, Wisconsin.

### Meeting of Iowa Mounumental Men

The Iowa Marble & Granite Dealers' Association held its annual session in Des Moines, Iowa, during the past month. The association went on record as opposing the proposed removal of the Iowa Soldiers' and Sailors' Monument, erected more than twenty years ago, on the grounds of what was then the State Capital. They declared that the memorial could not escape injury if an attempt was made to remove it. The following directors were elected: John Bogan, of Le Mars, Harry Montague of Mason City, D. M. Dean of Harlan, O. D. Harding of Chariton, W. J. Cadd of Boone, W. P. McIntire of Rolfe, O. V. Spezia of Oelwein, Carl Lane of Council Bluffs, and J. A. Wadell of Marengo. Officers, J. R. Golden, of Des Moines, president; A. T. Gallagher, of Corydon, secretary and treasurer.



## Meeting of The Stone Men at Atlantic City

**T**HE Thirteenth Annual Convention of the International Cut Stone Contractors' and Quarrymen's Association of North America, Inc., which was held at the Hotel Traymore, Atlantic City, N. J., on January 19th and 20th, was one of the most successful gatherings that the association has ever held. There were 61 members in attendance, representing fourteen cities, or nine states and Canada. After the meeting had been called to order on Wednesday morning, there

Traymore on Thursday evening, there was an address by the retired president, Geo. Oakley, Jr., of Toronto, which was responded to in a brief and happy speech by the new president, Mr. Henry Struble, of Bedford, Indiana. Mr. James B. Gillic spoke of the dignity of the craft of the stone cutter and welcomed the growing fraternal spirit that was shown in the trade. There was a brief talk by Philip B. Parker, by Mr. Fred Zimmerman, of Chicago, Ill., and also by Mrs. Charles G. Fanning, of Chicago. A few musical selections, followed by dancing, brought the evening to a happy close.

### NEW MEMBERS

Evergreen Steam Stone Works, Brooklyn, New York; James H. Harnden Company, Brooklyn, New York; M. Trudden, Brooklyn, New York; John Gill & Sons Company, Carthage, Missouri; Nelson & Hawkinson Cut Stone Company, Chicago, Illinois; E. L. Bergren, Chicago, Illinois; Riley & Jopling Cut Stone Company, Chicago, Illinois; A. E. Sward & Co., Chicago, Illinois; William Werner, Glendale, L. I., New York; Carr & Ball, Harrison, N. J.; J. J. Spurr & Sons, Harrison, N. J.; Barr, Thaw & Fraser, Hoboken, N. J.; David G. Morrison, Long Island City, New York; John Hutchinson & Son, New York; David Miller & Sons, New York; Rudolph Seus, New York; John R. Smith & Sons, New York.

### MEMBERS WHO WERE PRESENT

AMHERST, OHIO.—F. O. Delbridge, of Blum & Delbridge; F. A. Scherer, of the Ohio Cut Stone Company.

BALTIMORE, MD.—David M. Andrews.

BEDFORD, IND.—A. E. Dickinson; Chas. H. Greenway, of the Consolidated Stone Company; J. P. Falt, of the J. P. Falt Company; C. C. Ingalls, of the Ingalls Stone Company; Cornelius Shea, M. J. Morgan and E. F. Giberson, of the Shea, Donnelly & Giberson Company; Henry Struble and John D. Mauer, of the Henry Struble Cut Stone Company; W. L. Kerber, Carl Furst and Philip Furst, of the Furst-Kerber Cut Stone Company; Nat. Joyner, of the Indiana Quarries Company.

BROOKLYN, N. Y.—A. D. Baird, Jr., of Andrew D. Baird & Sons; Chas. Murphy, of Curran Bros. & Murphy; Joseph Gold, of Gold & Taylor Cut Stone Company; P. Ruppenstein, of the Evergreen Steam Stone Works; John Heinlein, of the John Heinlein Cut Stone Company.

BRIDGEPORT, CONN.—Jerome A. Jackson, of the Jackson Cut Stone Company.

CHICAGO, ILL.—E. L. Bergren; W. G. Diener, of Messrs. T. C. Diener & Company; J. W. Hamilton, of Fluck & Hamilton; Chas. G. Fanning, of Furst & Fanning; Ernst Helde-maier; Thomas J. Vernia, of the Indiana Quarries Company; W. McMillan and John P. Ries, of W. McMillan & Son; Charles E. Nelson, of Nelson & Hawkinson; Nels Nelson, of Olson & Nelson Cut Stone Works; H. Ebertshaeuser, of Stein, Ebertshaeuser & Company; A. E. Sward, of A. E. Sward & Company; Albert J. Ward, of Albert J. Ward & Company.

CLEVELAND, OHIO.—Charles W. Walters and C. W. McCormick, of the Cleveland Stone Company; W. A. C. Smith and F. B. Kellogg, of the Ohio Quarries Company.

EVANSTON, ILL.—A. E. Wernle, of the North Shore Stone Company.

HOBOKEN, N. J.—Frank H. Barr, of Barr, Thaw & Fraser; John Davidson, of Durie & Davidson; Joseph Spurr, of J. J. Spurr & Sons.

LONDON, ONTARIO.—A. Nobbs, of A. & E. Nobbs.

LONG ISLAND CITY.—Lincoln Pierce, of Wm. Bradley & Sons.

NEWARK, N. J.—Gilbert C. Brown, George Brown & Company; J. A. Monahan and W. J. Skelly, of the Monahan

### HENRY STRUBLE, OF BEDFORD AND CHICAGO

The new President of the International Cut Stone and Quarrymen's Association of North America

was an address of welcome by Mr. Sheen, the assistant city solicitor of Atlantic City. This was followed by business sessions and the various matters of interest to the trade were taken up and discussed and reports of officers and committees were read.

Mr. H. V. D. King, secretary of the Bedford Stone Club, read a paper discussing methods for promoting the use of stone. Mr. Wm. McMillan also read a paper concerning freight rates and on the improvement of conditions in the stone industry.

At the annual election of officers, the following were chosen: President, Henry Struble, Bedford, Indiana; vice-president, Gilbert C. Brown, Newark, N. J.; secretary, Wm. H. Guthrie, New York. The following new members were also appointed on the executive committee: Geo. Oakley, Jr., Toronto; John Davidson, Harrison, N. J.; Thos. J. Vernia, Chicago, Ill.

Among the souvenirs that were distributed at the meeting were leather bill folds by the Patch Mfg. Company, pocket pencils by the Lincoln Iron Works, and bronze match holders by the Bedford Foundry & Machine Company.

The social features of the meeting were specially enjoyed and reflected credit on the entertainment committee in charge, headed by J. Gordon Ray. At the banquet, held at the Hotel

Stone Company; H. J. Hoerner, of the H. J. Hoerner & Sons Company.

NEW YORK CITY.—John Miller, of David Miller & Company; James B. Gillie, of the South Dover Marble Company; Philip B. Parker, of the B. A. & G. N. Williams Company; J. Gordon Ray, of the Indiana Quarries Company.

PITTSBURGH, PA.—James W. Melville and Samuel Holmes.

PHILADELPHIA, PA.—George E. Scranton, of W. McMillan & Sons.

WASHINGTON, D. C.—C. T. Vandever, of the Indiana Quarries Company.

TORONTO, ONTARIO.—George Oakley, Jr., of Geo. Oakley & Sons, Ltd.; J. M. Scott, of Scott Bros.; John Vokes and Charles J. Penn.

#### VISITORS IN ATTENDANCE

Edward Sohn, of the Bedford Foundry & Machine Company, Bedford, Ind.; W. J. McGary, of the F. R. Patch Mfg. Company, Rutland, Vt.; I. I. Beinhower, of Lincoln Iron Works, Rutland, Vt.; Skinner Bros., of Brooklyn, N. Y.; Carl Howe, New York Central Lines, Chicago, Ill.; E. L. Roederer, New York Central Lines, Louisville, Ky.; Fred Zimmerman, vice-president C. I. & L. R. R., Chicago, Ill.; E. P. Vernia, C. I. & L. R. R., Bedford, Ind.; A. P. Lloyd, Big Four R. R., New York; Charles E. Smith, M. & O. R. R. Co., Pittsburgh; H. J. Russell, New York; Michael Cohen, New York; Joseph M. Cohen, Brooklyn; H. Jennings, Toronto, Canada; G. Stocker, Toronto, Canada; A. McMullen, Toronto, Canada; Joseph P. Stone, Providence, R. I.; Louis E. Hart, Chicago, Ill.; John C. Moore, Chicago, Ill.; H. V. D. King, Bedford, Ind.; Frank A. Lent, of STONE Publishing Company, New York.

#### LADIES IN ATTENDANCE

Mrs. Philip B. Parker, and niece, Miss Bernice Bemis, of White Plains, N. Y.; Mrs. James B. Gillie, of New York; Mrs. Charles G. Fanning and daughter, Miss Fanning, Mrs. William McMillan, Mrs. Henry Ebertshaeuser and daughter, Miss Ebertshaeuser, Mrs. John Ries, Mrs. A. E. Sward, and Mrs. John Hamilton, of Chicago, Ill.; Mrs. C. W. Walters, Mrs. W. A. C. Smith, and Mrs. F. D. Kellogg, of Cleveland, Ohio; Mrs. David M. Andrews, and Miss Andrews, of Baltimore, Md.; Mrs. Samuel Holmes, Miss Melville, and Miss McCreedy, of Pittsburgh, Pa.; Mrs. J. P. Falt, of Springfield, Mass.; Mrs. John Vokes, of Toronto, Canada; Mrs. A. E. Dickinson, of Bedford, Ind.; Mrs. Walter Skelly, of Newark; the Mesdames Skinner, of Brooklyn; Mrs. E. F. Giberson and Mrs. Michael Cohen, of New York.

### A Customs Decision on Crushed Marble

C. D. Jackson & Company, of New York, protested to the United States Customs Court against an assessment by the collector of New York on marble waste, crushed or screened, at 20 per cent. as an earthy or mineral substance manufactured. The importers protested that it was properly dutiable at 15 per cent. as an unenumerated manufactured article. The Board of General Appraisers overruled the protest of the importers and the decision of the board is affirmed.

### Receiver for the Reed Stone Company

During the past month, Robert Reed was appointed receiver of the Reed Stone Company, cut stone contractors and quarrymen, of Bedford, Ind. In 1913, the Reed Stone Company suffered a loss of \$46,000, which practically wiped out their working capital, through the failure of the Arlington Hotel Co., a corporation which was formed for the erection of the Arlington Hotel, Washington, D. C. After the Reed Company had gotten out and finished all of the stone work for the building, the Hotel Company went into bankruptcy, and never made any payment to the Reed Stone Company,

except \$15,000 in paper, which went to protest after it had been discounted. The receiver has issued a statement in which he says that it will probably take a year and perhaps a little longer to clear up the debts of the company. The statement of the assets and liabilities has not yet been compiled.

### Wisconsin Marble Men Meet

The Wisconsin Retail Granite & Marble Dealers' Association held a two-days' session at Milwaukee, during the past month. The president, Merrill Schaefer, in his annual report, called attention to the progress of the organization in the last year and urged hearty co-operation in the work of the national organization.

### Notes from the Stone Fields

#### MARBLE AND GRANITE

Jos. G. Calcagni has purchased the interest in the business of Novelli & Calcagni, at Barre, Vermont, held by the estate of William Corti. The purchaser is one of the founders of the concern and while it will retain its old name, the business will hereafter be conducted solely by Mr. Calcagni, the transaction having given him the entire ownership. Mr. Corti died in Italy last year. The firm is a prominent one in the Barre granite belt, and has made a specialty of fine statuary. The plant has a capacity of five gangs.

It is reported in Rutland, Vermont, that the Green Mountain Marble Company, if that city, will take over the old Boardman quarry, about a mile south of the village of West Rutland and located on the Sutherland Falls vein. The quarry was opened about 40 years ago, but was only operated for about a year. The marble is white with blue markings.

The Georgia Marble Company, of Tate, Ga., has opened an office at 805 Citizens Building, Cleveland, Ohio, in charge of Mr. Joseph B. Reinhalter. Mr. Reinhalter comes of a family that has been identified with the stone industry for several generations and has himself been prominent in the granite trade for many years.

N. A. Schanen has purchased the interest of Walter M. Blair in the Schanen-Blair Marble Company, of Portland, Ore., and hereafter the company will be known as the N. A. Schanen Marble Company. Mr. Schanen will assume the full management.

The Hawkeye Granite Company, of Waterloo, Iowa, recently removed to larger quarters and has installed a new compressor plant.

The great plants of the Vermont Marble Company are now operated with electric power supplied chiefly by four hydro-electric stations and two supplementary steam-driven electric-generating plants, which are used when needed. There are 570 motors with a total of 14,000 horsepower.

H. D. Floyd and Joe Blaski, of Eau Claire, Wis., have formed a company under the name of Floyd & Blaski and will establish a marble and granite manufacturing plant at Ladysmith, Wis.

The Valley Falls Bridge has just been completed and opened for traffic between the towns of Cumberland and Central Falls over the Blackstone River in Rhode Island. The bridge is 235 feet in length over all and 60 feet wide and is faced with granite.

The Broadway Association of New York City, opposes the paving of that thoroughfare with granite, although this material is recommended by the Truck Owners' Association, the Society for the Prevention of Cruelty to Animals, and other organizations in this city.

Mrs. Mary H. Nixon, an aged Worcester woman, who recently died, has left \$4,500 by will for the erection of an arch or gateway at the main entrance of Hope cemetery in

that city out of Milford pink granite. The bequest is made to the city of Worcester.

The lowest bid for the granite work for the new Vermont State building at Montpelier, to be erected for the use of state Library, Supreme Court, etc., was \$59,600. The contract will not be awarded until the bids for the remainder of the building are received.

The various United States Government offices in Denver, are being removed into the new big white marble post-office recently completed in that city.

Officials of the Mormon Church have decided to use Utah marble for the interior finish of the new church office building at Salt Lake City, Utah. Approximately \$60,000 worth of the native material will be used. Sanpete stone will be used in the corridors. The reception hall will be lined on all four sides with sixteen monolithic columns. There will also be large panels of sculpture in low relief.

Propositions have been made to the Salt Lake & Utah road to build a six-mile branch from Kirkham Station to Saratoga Springs, Utah. It is claimed that this road would give access to valuable deposits of marble and limestone on the shores of Utah Lake, near Pelican Point.

The new federal building at Glens Falls, New York, is completed with the exception of the placing of marble in the lobby.

Jos. Lambden & Son have sold a marble quarry on the Stewart farm, at Tuckahoe, N. Y., to the Emerson-Norris Stone Company, which has been its tenant. It was held at \$60,000.

The former John Hynes granite works property, on the Gowanus Canal, Brooklyn, offered in foreclosure proceedings, was bought by the plaintiff in the action, the Kings County Trust Company, on a bid of \$35,000.

There has just been erected in Greenwood cemetery, Brooklyn, an elaborate monument in memory of Conrad Stubenbord, and his son-in-law, Kenneth F. Sutherland. The monument is of North Carolina granite and contains a life-sized figure of a woman in bronze, by Stanley Edwards, a well known sculptor of Providence, R. I. The monument was erected by Farrington, Gould & Hoagland, of New York.

The marble and granite firm of Webb & Bee have made improvements at their plant in Corsicana, Texas, including the installation of a crane.

Mr. Alden Freeman, East Orange, N. J., has presented a statue of his ancestor, Captain Thomas Abbey, to the town of Enfield, Connecticut. Captain Abbey served in the French and Indian and Revolutionary wars, and was one of the most distinguished citizens of Enfield. The statue is to be of pink Tennessee marble.

Frank J. Vach and Frank W. Werner have established the Vach-Werner Monument Company, and opened a plant at 710 Winnebago Street, LaCrosse, Wis.

After a shut-down of some weeks, the mill of the Gouverneur Marble Company, at Gouverneur, N. Y., has resumed operations. The company kept its quarry going while the mill was closed down, with the result that it has considerable stock ahead.

The mill of the St. Lawrence Marble Company, at Gouverneur, N. Y., is being operated night and day. The company has closed its quarry inasmuch as it has now a large stock of blocks on hand.

#### LIMESTONE AND SANDSTONE

At the annual election of the Bedford Stone Club, of Bedford, Indiana, held the past month, Mr. Henry Struble, of the Henry Struble Cut Stone Works, of Chicago, was elected president, Mr. C. C. Ingalls, of the Ingalls Stone Co., vice-president, and Mr. B. P. Crowe, of W. McMillan & Sons, treasurer. Carl Furst, of the Furst-Kerber Cut Stone Com-

pany, and Nelson Joyner, of the Indiana Quarries Company, were chosen directors. Mr. H. V. D. King, joint secretary of the Stone Club, and of the Indiana Limestone Quarrymen's Association, will still continue in office indefinitely.

The Church of Our Lady of Mt. Carmel, at Newtown Avenue and Crescent Avenue, Astoria, L. I., is completing a new front of Indiana limestone. The style is English Gothic of the 15th Century and is the only example of its kind in the Brooklyn Diocese.

The Holran Stone Company, at Maple Grove, near Tiffin, Ohio, has given a contract for extensive improvements at its quarries to J. H. Jones, a Fostoria contractor. The company will build large lime kilns and the cost of the improvements will amount to more than \$75,000.

The Salt Lake City Commission has voted to allow the Salt Lake Terminal Company to replace the asphalt paving between its tracks with sandstone blocks.

The new Children's Court Building at 137 East 22nd Street, New York City, has just been dedicated. This building is four stories high in the style of the Italian Renaissance, and is built of Indiana limestone.

There has recently been completed and dedicated the new county building for Schoharie County, in Schoharie, New York. The building was designed by Demers, Mosley & Campaigne, of Troy, and Nial Bros. Construction Company, of Troy, were the contractors. The building is erected of Schoharie limestone, from quarries that have been operated for more than a hundred years.

The large stone mill of J. Hoadley & Sons, at Stinesville, Indiana, completed only a year and a half ago at a cost of \$100,000, was completely destroyed by fire the past month. The plant was insured for \$45,000, and there is a salvage estimated at \$10,000. About 50 men were employed. Because of the destruction of their plant, the Messrs. Hoadley have leased the big "Black Diamond" stone mill at Bedford, with the privilege of buying it, and will complete the orders they have on hand. When the fire occurred, the company had enough orders to keep them busy for a long time.

The International Association of Stoneplanermen has been organized at Bedford, Indiana. This is really an abandonment of the union known as the Stoneplaners' Union No. 12,866, by a body of the men. The old union had a five-year contract with the Bedford operators, and that contract is to be carried out by the new organization. The present union is not affiliated with any other organization and the men at the head of it expect the membership will spread all over the country, although it was formed especially for the men in the Bedford Oolitic stone belt. An officer stated that one of the objects of the new union was to prevent strikes, although it would maintain a campaign for proper wages and working conditions.

#### SLATE

The imports of slate into Great Britain for the month of November last had a value of a little over \$7,000. Of this amount, \$4,900 came from France and \$2,200 from Portugal. The slate quarries in France are in a district not directly affected by the war.

Considerable development work has been carried on by the Chatsbury Slate Company, in New South Wales. During the past year about 40,000 slates were made. The adjoining property is held by the Argyle Slate Quarries, Limited, but nothing has been done here as yet, save to prospect for a suitable site for a quarry.

The Owen Brothers, of Granville, N. Y., have leased the Excelsior Slate Quarry, about three miles from Salem, N. Y., and will begin work in the spring with about 40 men. They are now pumping the water out of the old pit. The quarry has not been worked in nearly 40 years.

## Drawing Simple Tracery Windows

THE Gothic style is built up in almost every detail upon a basis of geometric design, and the examples shown herewith will be found interesting exercises in the use of instruments for the production of decorative devices, writes R. S. Bowers in the *Building World*, of London.

Many traceried windows are based on a system of equilateral triangles; thus, the simple form in Fig. 1 should be set out as in Fig. 2 in the following manner: Draw a base line A C, and on it mark the points A, B, and C 1 in. apart; from each of these draw with a set-square straight lines sloping upwards at angles of 60 degrees as shown. Draw uprights from A and C, and through the point at B where the

will be found to form a "diaper" pattern capable of extension over any area, each unit being of the outline of Fig. 7.

For the present purpose, however, this diaper is bounded by the lines of the pointed arch, which are struck from points on the base line  $\frac{3}{16}$  in. in from H and J. The main constructional lines being thus obtained, the double lines,  $\frac{1}{16}$  in. apart, as shown, should be put in,  $\frac{1}{32}$  in. on either side of the centre lines. For the detail required to clothe the resulting skeleton, Fig. 7 should be followed; it shows one of the three complete units, and the other parts will need precisely similar treatment. First draw centre lines down across, and from the intersection of these mark points  $\frac{1}{2}$  in. up and down and  $\frac{7}{16}$  in. on either side; mark the  $\frac{3}{16}$  in. space at O and draw the curve P on either side. With the same radius draw curves as at Q and R at the top and bottom, these being continued upwards as at S by short curves from the outer centers as at T, thus completing what is known as a "quatre-

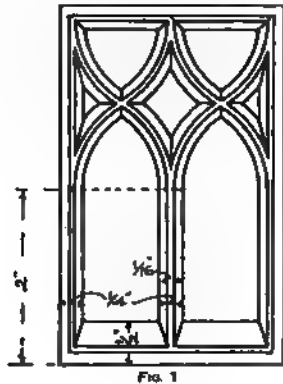


FIG. 1

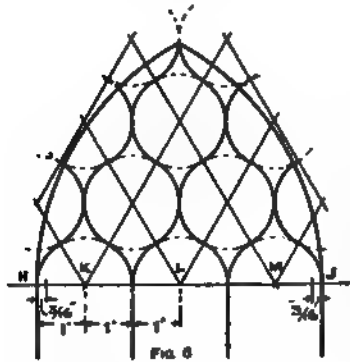


FIG. 6

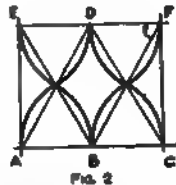


FIG. 2



FIG. 4



FIG. 5

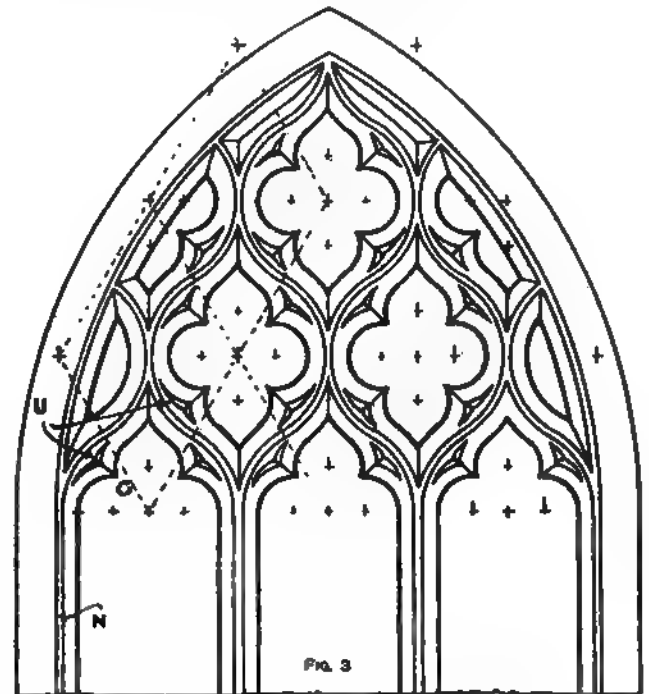
### LAYING OUT TRACERY WINDOWS

Fig. 1—A simple example of tracery. Fig. 2—Setting out lines for Fig. 1. Figs. 4 and 5—Later forms of cusping. Figs. 6 and 7—Setting out lines and details for Fig. 3.

lines cross draw a horizontal E F. It will then be easy, taking the six points A—F as centers and with 1-in. radius, to draw the curves linking up as in the figure. These are the centre lines of the tracery, and should disappear in the finished drawing, which can easily be made from Fig. 1, where the necessary dimensions will be found.

Observations will show that this early form of tracery was soon enriched by the addition of small foils or "cusps," as at G in Fig. 3, the main line remaining comparatively simple, while in later work the cusps are truncated with short straight lines as in Fig. 4, and increased in number, or supplemented with smaller ones on either side as in Fig. 5.

All the centers employed are indicated by crosses in Fig. 3, but for the actual setting out the reader is referred to Fig. 6, which shows the center lines as in the previous example. Draw the line H J, and divide it into six spaces each 1 in. long. From K, L, and M draw a trellis of lines at 60 degrees as accurately as possible, and from the various centers obtained by their crossing draw circles of 1-in. radius, the required portions of which are shown by thicker lines. These



A STONE TRACERY WINDOW

This has the simplest form of cusps and the methods for laying out are shown in details in the other illustrations

foil." The detail of the cusps can be inserted with a  $\frac{1}{2}$ -in. radius from each of the four inner centers, and a couple of freehand lines as at U in Fig. 3.

This figure will prove a good test of neat and accurate drawing, and can be finished in ink or pencil. In all drawing a variation of thickness of the lines is of decorative value, and it can be employed to make clear and distinct what might otherwise become a maze of lines, as in the present instance, where the appearance is greatly enhanced by the heavier lines used for the contours.

### Quincy Quarrymen's Bill Signed

The new bill of prices between the Granite Manufacturers' Association of Quincy, Mass., and the Quarrymen's Union, has been signed and will remain in force for at least four years. If the bill signed with the granite cutters runs for five or more years, then the quarrymen's bill will run for the same period. The main feature of the bill fixes a minimum wage scale of 33 cents per hour for quarrymen and a minimum wage of 28 cents per hour for laborers. The old rate

paid to the quarrymen was an average of 30 cents per hour. The powder men, channel bar drillers, riggers, and general repair men will get an increase on account of the danger of their duties.

### Business Brevities

According to reports, the value of stone imported into Great Britain for the month of November last was valued at \$227,000. This is in comparison with imports to the value of \$358,000 for the same month one year ago. In addition to marble from Italy, England formerly used considerable granite and basalt from the Scandinavian countries, Germany and Belgium.

The Lake Shore Sand & Gravel Company, of Cleveland, Ohio, has increased its capital stock from \$25,000 to \$100,000.

The citizens of Nashville, Tenn., have inaugurated a movement for the erection of a monument in that city to President Andrew Jackson, worthy of comparison with the memorials erected to Washington, Lincoln, Grant and McKinley.

During 1915, there were invoiced at the American consulate at Sherbrooke, Canada, for importation to the United States, crude asbestos valued at \$621,720, asbestos fibre valued at \$887,148, and asbestos sand valued at \$106,869.

The Mayor of Houston, Texas, will name the committee of citizens to have charge of the erection of a monument to General Sam Houston by the school children of Texas.

A movement has been started in New Orleans for the erection of a monument over the grave of Reverend Father Thomas Lorente, founder of the Spanish Dominicans, at Rosaryville, La. Father Lorente died August 24, 1915.

The Holran Stone Company of Cleveland, Ohio, has increased its capital stock from \$200,000 to \$350,000.

The New York and New Jersey Mausoleum Company has recently been incorporated for the purpose of erecting a mausoleum at Humboldt Street and the Boulevard, Jersey City. The estimated cost of the structure is \$200,000.

Representative Ambrose Kennedy, of Rhode Island, has introduced a bill in Congress for the erection of a monument in the National Cemetery at Arlington, Va., to women who gave their services as nurses on battlefields and in hospitals during the Civil War.

The Michigan Limestone & Chemical Company, Inc., of Calcite, Mich., which does a general business in quarrying, refining, smelting, etc., with a capital of \$2,500,000, has been authorized to do business in New York. The representative is J. D. Mooney, 55 Liberty Street, New York City.

The Wisconsin Granite Company, Inc., of Chicago, Illinois, who produce paving and building materials, with capital of \$200,000, have been authorized to do business in New York State. The representative is J. Monaghan, of Alexandria Bay, N. Y.

The United States produces more talc and soapstone than all the rest of the world combined.

Senator Jones, of Washington, has offered a bill in Congress setting aside a portion of the grounds between the Capitol and the Union Station in the National Capital as a site for a memorial to American women and their achievements.

The Motor Truck Club of America has written a letter to Marcus M. Marks, president of the Borough of Manhattan, in favor of granite block pavement for lower Broadway, New York.

The plants of the Lavino Quarries Company, and the American Magnesia Company, near the village of Plymouth Meeting, three miles from Chestnut Hill, Pa., were destroyed by fire the past month with a loss of about \$25,000.

Plans are on foot in Washington for raising funds for the erection of a monument in that city in memory of the colored soldiers and sailors who took part in the wars of the country.

At of the Hardwick Polishing Company, at Hard-

wick, Vermont, was totally destroyed by fire the past month. The loss considerably exceeds the insurance of \$1,500. It was only two weeks ago that the company reduced its policy on the grounds that the insurance rates were too high.

A bill has been introduced in the New York Legislature appropriating \$5,000 for the erection of a monument to Governor Daniels D. Tompkins, at Tompkinsville, Staten Island.

The Utica Stone & Construction Company, of Utica, New York, has chosen the following directors: Frederick T. Proctor, Thomas B. Proctor, J. T. A. Doolittle, Geo. M. Weaver and Geo. M. Weaver, Jr.

The petition in bankruptcy brought against the Royal Marble Works, Inc., of 612 East 16th Street, New York, has been dismissed by the court.

Committees have been appointed in Minnesota to collect funds for a monument in honor of the late Governor Hammond, of that state.

Peekskill, New York, expects to dedicate its new soldiers' monument erected on Park Square, on the coming Memorial Day.

The Interstate Commerce Commission, at a recent meeting, upheld increased freight rates on crushed stone from Racine to Chicago, but denied an increase from Waukeshaw and Burlington to Chicago on the same freight.

### Construction Notes

The specifications for the new armory to be erected at the corner of North Broadway and Quincey Place, Yonkers, N. Y., are ready. They call for a building of seam-faced granite, approximately two stories high in front with an eighty-foot tower of the same kind of stone. It is estimated that the cost of building will be between \$110,000 and \$125,000.

W. B. Thomas, architect, of Stockton, Cal., is preparing plans for a \$250,000 moving picture house in that city.

The Penobscot Building, at Detroit, Michigan, will be remodeled for the builders' and Traders' Exchange of that city. Plans for the work have been completed.

A twelve-story and basement store and light manufacturing building will be erected for the Brunswick Realty Company, as lessee, at the corner of Madison Avenue and 29th Street, New York. It will be of limestone and brick and terra cotta.

Jardine, Hill & Murdock are the architects of the 16-story building which will be erected at the corner of Madison Avenue and 38th Street, New York, at the site of the old Havemeyer Mansion. The facades have been designed in the Adam style, and the lower stories will be of limestone and marble. The shafts are to be of light brick and the upper stories of terra cotta.

Architects are preparing plans for Breckenridge Hall, a new administration building for the College of Industrial Arts at Denton, Texas, for which the last legislature appropriated \$1,400,000. Contracts will be awarded by February 15, 1916.

The Kirkwood Avenue Christian Church, of Bloomington, Indiana, will erect a new church building to cost about \$100,000.

Wichita County, Texas, has voted \$255,000 in bonds for a new court house, at Wichita Falls.

The city of Orange, Texas, will erect a \$100,000 high school building, bonds for the purpose having been sold.

The plans of Wilbur T. Mills, Columbus, Ohio, for the new State Normal School at Kent, Ohio, are ready. The estimated cost of the building is \$120,000.

The Foster & Creighton Company, of Nashville, Tennessee, has been awarded a contract to build a three-story dormitory for the Ward-Belmont College, at Nashville, Tennessee.

The First Congregational Society, of Sioux City, Iowa,

will reconstruct their church building at an estimated cost of \$70,000.

The Fourth and First National Banks, of Nashville, Tennessee, which have been consolidated, will erect a new building at Union and 4th Avenues, in that city, costing several hundred thousand dollars. The building is to be five stories high, of stone and brick. The plans are by Ludlow & Peabody, architects, New York.

The Society of the Helpers of the Holy Souls, of New York City, will erect a six-story convent at 86th Street near Park Avenue, New York, after plans by McGinnis & Walsh, of this city. The building will be of limestone and brick, in the French Renaissance style, and will cost \$100,000.

The Winchester Repeating Arms Company have plans for

The Masons of Spartanburg, S. C., are planning the erection of a temple to cost \$60,000.

Lockwood-Greene & Company, of Boston, Mass., are arranging for the erection of a factory building at Sarnia, Ontario, to cost about \$500,000.

Proudfoot, Bird & Rawson, of Des Moines, Iowa, are preparing plans for an \$80,000 high school building for Audubon, Iowa.

The Buffalo Union By-products Coke Company, is considering plans for a plant at Buffalo, New York, to cost \$1,500,000.

Wilson Potter, New York, is preparing plans for a high school to cost about \$200,000, for Summit, N. J.

Griggs-Cooper & Company, of Minneapolis, Minnesota, will erect a \$200,000 factory on University Avenue.

George S. Mills, of Toledo, Ohio, is preparing plans for a sixteen-story hotel costing \$2,000,000 for the Bond Hotel Company, in that city.

James H. Ritchie is preparing plans for a library building for the Massachusetts Agricultural College, at Amherst, Mass.

The Keith Theatre Company is planning to erect a \$300,000 theatre on Newark Avenue, Jersey City, N. J.

The Trinity Episcopal Congregation, of Huntington, W. Va., will erect a new church building costing about \$100,000 after plans by E. N. Alger, of that place.

State Architect Charles H. Chandler, of Kansas, has prepared plans for a \$100,000 building for the Normal School at Hays, Kansas.

The city of Medford, Mass., has appropriated \$200,000 for a new city hall.

It is expected that the contract for the new \$125,000 building for the Greenwich Trust Company, at Greenwich, Connecticut, will be awarded in March.

The Russell Sage School of Practical Arts for Young Women will be erected at the Troy Female Seminary, in Troy, N. Y., Mrs. Russell Sage having donated \$250,000 for the purpose.

The Young Men's Hebrew Association of Chattanooga, Tennessee, will erect a building at an estimated cost of \$75,000.

#### ONE OF THE TOWERS OF SAN GIMIGNANO

The mediaeval town, 24 miles from Siena, has more than a dozen of these towers, which served as fortresses for the powerful feudal families

a five-story factory to cost more than \$300,000, at New Haven, Connecticut.

C. P. Cody, of Erie, Pa., has prepared plans for a ten-story office and store building to cost about \$100,000.

The Seaboard Air Line Railway Company is planning the erection of shops at Howell, Ga., to cost between \$100,000 and \$150,000.

Butler, Pa., will erect a \$200,000 high school after plans by William G. Eckles, of New Castle, Pa. Bids will be received about April 1st, 1916.

The Texas Steel Company is planning the erection of a plant at Beaumont, Texas, to cost about \$2,500,000.

#### Obituary Notes

Benjamin J. Richards, for many years prominent in the granite industry, at Vinalhaven and at Hallowell, Me., is dead at his home at the latter place at the age of 80 years. Mr. Richards was born at Frankfort, Maine, and retired from active business a number of years ago.

James Adie, a well known granite manufacturer of Barre, and a prominent citizen of that town, is dead at the age of fifty-two years. Mr. Adie was born in Scotland, but came to America about thirty years ago. After being associated with various concerns, he became connected with James S. Milne, about eight years ago.

William Passmore Meeker, a prominent manufacturer of marble and granite monuments at Newark, N. J., died suddenly at his home in Maplewood, N. J., the past month. Mr. Meeker was born in Newark forty years ago, and was graduated from Princeton University.

Edward Maloney, for forty-five years a resident of Minneapolis, is dead at his winter home in San Bernardino, Cal., at the age of 83 years. Mr. Maloney was an old time Minneapolis contractor and operated the first stone quarry in that city.

August F. Manegold, for nearly sixty years a resident of Milwaukee, and one of the state's most widely known men, died the past month after a brief illness. Mr. Manegold was born in Germany in 1852, but came to this country when he was five years old. At the time of his death, he was presi-

dent of the Manegold Stone Company, and also of the Wauwotosa Stone Company.

Michael Hanich, 75 years old and manager of the Hanick Quarry & Construction Company, of St. Louis, Missouri, is dead after a brief illness.

Jos. A. Meyers, head of the firm of Meyer Bros., Cut Stone Contractors, of Milwaukee, is dead at the age of 55 years, after an illness of many months. Mr. Meyers served in the State legislature from 1886 to 1888.

### Government Work

Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until February 24th, for the construction of the new post-office at Batavia, N. Y., and until March 10th, for the construction of the new post-office at Kalispell, Montana.

All the bids for the construction of the new post-office at Huntington, W. Va., have been rejected.

The contract for the new post-office at St. Petersburg, Fla., has been awarded to M. L. Holladay, Greensboro, N. C., at \$89,717.

### Business Embarrassments

Creditors have asked the courts for the appointment of a receiver for the Tiffin Lime & Stone Company, and the West Lime & Stone Company, both of Tiffin, Ohio.

A schedule in bankruptcy has been filed by Michael Cerussi, conducting a marble works at 271 East 135th Street, New York. Liabilities, \$10,235, assets, \$11,299.

Geo. W. Vanderbilt, manufacturer of tiles, at 103 Park Avenue, New York, has filed a petition in bankruptcy, with liabilities of \$10,735.

A petition in voluntary bankruptcy has been filed by the Omaha Marble & Tile Company, of 110 North 14th Street, Omaha, Neb. W. C. R. Nollman is president of the company.

The General Construction Company, of Milwaukee, has been declared bankrupt in the United States Courts and the assets of the company, except real estate and accounts receivable, will be sold at public auction on February 15th, 1916, at the bankrupt's place of business, 3038 Galena Street, Milwaukee, Wis.

### Trade Notes

There are some plants in which it is necessary to operate a surfacer close to a wall. There are others in which it is sometimes practical, and still others where it is occasionally convenient. To meet the demand of such plants, for a surfacer of the "Barre" quality, which could be operated at any point in the plant, the Trow & Holden Company put on the market the "Barre" Crane Surfacer. This machine is the result of exhaustive experiments. It is designed to do the same work as the "Barre" Sliding Bar Surfacer, but for use under different conditions. It is equipped with flat faced wheels, but, if desired, flange wheels for tracks will be furnished without extra charge. The standard is made of double thick steel tubing, supported rigidly in the base casting, permitting of no vibration. The bar carriage is supported by two pairs of adjustable shoes, one above and one below. The long distance between these bearings reduces the strain and wear to a minimum. The adjustment of the shoes keeps the bar always in alignment at right angles with the standard, and prevents all slackness, twisting, rattling or wobbling. The carriage is easily raised or lowered by means of the windlass. The bar consists of two cold drawn steel rails, fastened securely at each side of the carriage and to a block at the end of the bar. This bar will not sag. It will swing a complete circle around the standard, thus covering the area from one position. The bar and bar carriage are

furnished to fit any standard. The machine is also furnished without the base, equipped with fittings to be attached to a wooden post. The Trow & Holden U-Shaped Tool Holder is used because of its strength and durability. This holder has no foot to break off. Provision is made for taking up any wear and for holding the tool perpendicular and steady, so that all the blows are fair and straight up and down. The tool holder moves along the rails very easily. There is practically no rebound to the frame. This machine is equipped with the "Barre" Pneumatic Surfacers Tool, which is also furnished separately, to fit any holder of standard size, and is well known among finishers. This tool is of the valve

### TROW & HOLDEN "BARRE" CRANE SURFACER

type, simple, durable, powerful and economical in air consumption. It has the same great capacity for work as the other "Barre" pneumatic tools. The machine is made in two sizes, corresponding to the "Barre" sliding bar machines.

The Ingersoll-Rand Company, 11 Broadway, New York, N. Y., have issued two new booklets, Forms 76 and 9,201. Form 76 is an 80-page catalog, subject—"Water Lifted by Compressed Air." It is a very complete treatise on the air lift and explains in thorough detail the air lift system of pumping. To all those in any way interested in adequate water supply, a copy of this booklet will be found invaluable, since it very intelligibly presents all the facts essential in analyzing a proposition involving the use of clean water in quantity. Form 9,201 is a 128-page 6x9 catalog on Calyx Core Drills. The principal function of the core drill is the determination of the character, order, thickness and extent of the materials beneath the earth's surface, by means of cylindrical cores which it extracts. In coal and metal mines, stone quarries, contract work or for canal or tunnel developments projected, the core drill is used and takes what is otherwise an unknown quantity and converts it into an absolute certainty. By determining the actual conditions in advance, it is a medium to save thousands of dollars in machine equipment, underground workings, etc., that might otherwise be expended only to find a barren property. The booklet is illustrated, gives size and capacities of the different types and shows the apparatus in operation in the various fields.

The Thomas H. Dallett Company, Broad & Federal Streets, Philadelphia, Pa., have issued a new circular concerning their Dallett Yankee-B Plug Drill. This drill has been on the market for nearly three years and has made good. It is in use in hundreds of stone sheds in all parts of the country and many testimonials have been given as to its satisfactory operation. The leading claims on this behalf by its makers are for rugged construction, durability and great power.



## EVIDENCE

If you will inquire as to the tools used in the execution of the finest pieces of carving, in the majority of cases the answer will be—"Dallett."

If you will go into several plants, large or small, in different parts of the country and count the tools in use, you will find the majority to be—"Dallett."

If you will ask the workmen what tool they like and recommend, the majority will answer—"Dallett."

Reader—some of these concerns are your competitors. They are finding it profitable to use "Dallett" Tools—how about yourself?

We will gladly send our tools subject to your approval.

**Thos. H. Dallett Co.**  
PHILADELPHIA, PA.

## SAFETY FIRST

*in Blasting Operations Demands*

### The SAFE, SANE and SURE EXPLOSIVE]

Two Ingredients—a Solid and a Liquid. Can be used in the coldest weather without the dangerous thawing process necessary for nitro-glycerine dynamite.

**RACK-A-ROCK** is Safe because it is non-explosive before saturation and can be transported and handled like any other commodity without danger of premature explosion. Even after mixing it has a larger safety factor than other explosives of equal strength.

**RACK-A-ROCK** is Sane because it is Safe; it is a guarantee against accidents to your workmen. It does not freeze, therefore no danger from thawing processes. It is economical.

**RACK-A-ROCK** is Sure. Its effectiveness is such that it has been used on innumerable blasting operations—from the Hell Gate explosion of a quarter million pounds in 1885 down to the present day—in railroad cuts, canals, road work, harbor and river improvements and quarry operations all over the world.

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Send to-day for free Booklet describing it.

**Rendrock Powder Company**  
106 Wall Street, New York City

## Carborundum Steel Center Wheels for Coping Stone

If breakage will be Carborundum Wheels are used. A rim of a Carborundum Steel Center Wheel is

bonded securely to the steel center disc which adds wonderful strength to the wheel.

Carborundum Steel Center Wheels can be run with safety at the recommended operating speeds of from 6,500 to 7,500 surface feet per minute, and the danger of breakage from side strain will be reduced to a minimum by their use.

Your power consumption will be reduced and less strain will be placed on the stock you are cutting if you use Carborundum Steel Center Wheels.

Carborundum is the stone abrasive. The Carborundum Steel Center Wheel is offered to the stone trade in standard sizes from 12" to 24" diameter. Wheels of larger diameters can be furnished if desired.

*Let us submit a trial wheel.*

**THE**  
**CARBORUNDUM COMPANY**  
NIAGARA FALLS, N. Y.





# STONE AND MARBLE WORKING MACHINERY AND WIRE SAWS

## Carborundum Coping and Moulding Machine, Showing Heavy Moulding in Work

**T**HE above cut shows our standard machine for coping and moulding. According to requirements we furnish it from 3 feet up to 10 feet between the uprights, with table from 10 to 14 feet long.

We can construct a machine of this kind from a second hand stone or machine planer, using only the heavy main parts. We can cope 2,000 ft. of 1" thick marble per day.

Combination Carborundum Machines  
for Gang Coping, straight and cir-  
cular Mouldings.

Circular Face Moulding Attachments.  
Baluster Attachments.

Carborundum Heads for Planers.

Openside Coping and Moulding Ma-  
chines.

Openside Carborundum Machines with  
Turning Head.

Carborundum Fluting Machines.

Column and Base Turning Machines.

Coring Machines.

Wire Saws.

Carborundum Lathes for Turning and  
Fluting.

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## JULIUS WEGNER MACHINE WORKS

INCORPORATED

Astoria, L. I., New York

# Flory Hoisting Engines STEAM AND ELECTRIC

## Machinery for Quarries and Stone Plants

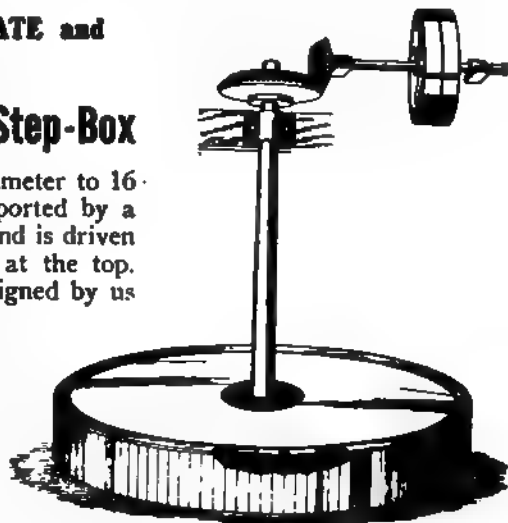
The Latest and Best Appliances for the Economical and Efficient Handling of Stone

We make Machinery for Sawing and Planing SLATE and  
SOFT STONE

### Our Improved Rubbing Bed with Adjustable Step-Box

The platen is made of cast iron of any diameter to 16' any thickness. The platen is supported by a spider on a vertical cast-iron shaft and is driven by bevel gears from a countershaft at the top. The adjustable Step-Box was especially designed by us

for convenience in making needed repairs or cleaning. Besides being adjustable it is sectional and can be taken apart to remove the step without raising the entire bed. The step turns on disks of special bronze and steel, which will not heat readily and reduces the friction to a minimum.



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## S. FLORY MFG. CO., Bangor, Pa.

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Write for 1914 Catalogue

## J. S. MUNDY

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FRANK W. HOYT, Editor

VOLUME XXXVII

MARCH, 1916

NUMBER 3

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## Pushing the Sale of Stone



MOVEMENT is on foot to form an organization of the granite manufacturers in the United States to conduct a publicity and advertising campaign to increase the use of granite as a structural material. A national association is contemplated that will represent a total investment in quarries and equipment in excess of \$25,000,000. It is expected that this will include practically every large granite manufacturer in New England. A committee of nine, made up of representatives of prominent and progressive companies, is now at work drawing up tentative plans, and when these are perfected the preliminary steps will be taken for the formation of a definite organization. One of the plans that has been discussed is to secure an expert consulting engineer and a field secretary to confer with prospective builders, both public and private, and furnish figures on the cost of granite for buildings, and in general present the merits of granite for construction in comparison with other forms of material. The engineer and secretary will be charged with the promotion and publicity of the association, which probably will have its headquarters in Boston.

Until the organization has been formed and the methods of operation worked out it is impossible to speak in detail of this scheme. But the action of the granite men may be hailed as the first definite movement of this branch of the stone trade in the right direction. It promises well, not only for the building up of business, but also as bringing the granite men more in line with the progressive spirit of the age. For some time past the producers of monumental granite have been active and keenly alive to their opportunities. They have realized the advantages of concerted effort and of publicity, and have made a fairly free use of printer's ink. With a few notable exceptions, however, the quarries that get out structural granite seem to have taken no note of the changes that have come about in modern methods of doing business. They have made no determined effort for publicity and they have worked independently with the old idea of bitter trade rivalries. Their plan would seem to have been to abuse and disparage all competitors, and to depend only on

individual effort and keen salesmanship to land orders. Of course, in the final try-out it is these two things that put orders upon any company's books. But they are handicapped at the start if they do not recognize the necessity for a broad spirit of co-operation.

The "get together" idea is gradually making its way in all branches of the stone industry. The younger men in the trade are breaking away from the conservatism and intense individualism of their fathers. They know that no man can stand alone in these days. They do not fear those in the same line of business with themselves, for they see that much can be accomplished when all work together in a friendly spirit. Is it too much to say that a few years ago many a stone man would welcome the turning of a building contract to terra cotta or artificial stone rather than to a different variety of stone from that which he represented? It was this spirit that did much to encourage the use of the various substitutes for stone. Now any man worth his salt in the trade will work heart and soul to secure the erection of a building in natural stone. He will honestly and truly welcome the use of granite, marble, limestone or sandstone, no matter what his individual disappointment may be that his own particular product is turned down. The rallying cry and slogan of every stone man must be: "Natural stone above everything."

In the plans that have been discussed for some time past for exploiting different varieties of stone, great weight has been laid upon the necessity for reaching the general public. No one would dispute the fact that it is the part of wisdom to endeavor to educate the public as to the merits of stone construction. But we are doubtful if much can be accomplished along the lines that have been indicated. Very few men go to an architect and instruct him: "Build me a limestone residence," or a marble bank or a granite store. As a matter of fact, few men can tell one stone from another, except very indefinitely. It is well that they should be educated as to the particular merits and capabilities of the different stones. But this, by itself, is not going to bring much new business to the quarries. What is necessary, first of all, is to preach the wisdom of building in natural stone. Make the public know

that there never has been and never can be any satisfactory substitute for the genuine quarry product; that he who builds in terra cotta or artificial stone is sure, sooner or later, to be bitterly disappointed with the results. Contrast for him famous stone buildings that have stood for centuries and grown in beauty with the ugly structures made of sham materials that have cracked or fallen to pieces almost before the mortar was dry. What the stone trade should seek to accomplish is so to educate the public that a prospective builder will go to his architect and talk to him after this fashion:

"Build me a house. I do not care what material you use, so that it is not a cheap and nasty imitation. I want a house that will stand up as long as I live; that I can pass on to my children or sell, if necessary, without losing half of my investment. My home must be a credit to my taste and judgment and one that I shall not be ashamed or afraid to live in."

### Was there a Stone Age in Egypt?

William W. Everts, of Boston, has gathered the testimony of various authorities as to whether the ancient Egyptians, among the greatest workers of stone for structural and monumental purposes in the history of the world, were ever in such a backward state of civilization that they used stone itself for weapons and implements. Edward Meyer ("History of Antiquity," 1913, I, 2, 64) refers to flint instruments found in the Egyptian stone age and says: "The flint knives are cut extra fine, with perfect regularity, very thin and sharp, with a toothed edge like a saw. There are also points of lances, arrows and harpoons."

The men who spent years in exploring Egypt have a different story to tell. Richard Lepsius ("Zeitschrift für Aegyptische Sprache," 1870, pages 95 and 118), referring to Arcellius' book on flint instruments found in Egypt at a certain place, says:

"I picked up ten specimens. In the next field I could have gathered 1,000, and in fields near by 100,000. The enormous number of these objects would have deterred me from supposing them to be products of art. What would be thought of an industry that did not consider its own products worth taking up, but left them unused. They are not spoiled. No better can be found anywhere. They are rough as they are elsewhere. They are not heaped up but scattered over the ground just as nature left them. Some might be used for knives, but most of them are round, flat pieces of little use for any business. These are not technical instruments, but natural products. Some travelers claim to have found flint instruments in the Sahara, but why look for them in the desert when they are so abundant in the valley of the Nile? It is improbable that anyone has found an instrument of flint in the chalk strata of Egypt. The idea of a 'stone age' does not apply to Egypt." Other writers give similar testimony.

Henry Brugsch ("History of Egypt," 1877, page

27) agrees with Lepsius and says: "Egypt knows nothing of a stone, a bronze and an iron age." Mariette and Chabas hold the same view. Dana, in his geology, explains the resemblance of a piece of flint to a knife, a spear head or a saw when he says: "Flint breaks with a deeply conchoidal fracture and a sharp cutting edge."

Laparrent ("Geology," 1893, page 134) refers to the so-called stone age in Europe in these words: "In our day there are savage peoples who still use flint. As glaciers diminished at the time of the first Egyptian dynasty, men in Europe, if there were any, did not use metal."

### War Conditions in Carrara

The Carrara correspondent of an English trade paper says that the demand for marble has not increased lately, but the general state of affairs has rather improved. Most of the workmen not serving the country as soldiers have been engaged by the Government for the purpose of working near the front in cutting roads in the Alps, so as to relieve the soldiers of part of their work. They earn good wages and are able to send nearly all to their families as they are supplied free with shelter and food.

The families of the soldiers who are in need of help are being paid a weekly allowance by the Government, and in addition they receive further help from the special committee in Carrara that has raised money for that purpose. A large number of the soldiers now residing in Carrara contribute also to add to the movement of the town. Many new recruits are under training. The workmen who remained in Carrara are now nearly all employed owing to their reduced number, and there is just sufficient work to keep them carrying out all the orders for rough, sawn and worked marble. Carrara engineering firms previously producing machinery for working and quarrying marble are now engaged on ammunition.

### The War and the Quarrying Industry

The quarrying industry is still suffering from the holding up of orders in consequence of the war, says the English *Settmakers and Stoneworkers' Journal*. Several quarries have been closed entirely, and at others the staffs have been reduced. In some cases, rightly or wrongly, the opinion is held that the dismissal of men is due more to a desire to impose a form of economic conscription than to any inability to utilize the services dispensed with. Be that as it may, the fact remains that many men are now being compelled to leave the quarrying industry who will probably never return to it. The result of this need not be pointed out. It is perfectly obvious, and, whilst we realize the supreme importance of carrying the war to a successful issue, we are of opinion that the interests of the industry with which we are connected are not receiving the consideration to which they are entitled.

## Shams in Our Schools



HERE are constant complaints in our newspapers that the schools do not fit young men for business, that the applicants who present themselves for positions are not well grounded in the very fundamentals of education. Merchants who are not old fogies but progressive men of affairs declare that it is almost impossible for them to find boys who can write, spell or figure well enough to be welcome in shop or counting room. Hundreds of thousands of young women have invaded the business field, and they are ambitious to fill the best places. The same complaint is made of them. Bright and keen as may be their natural wit, they lack training in the essentials. How often do we hear wails from distressed employers that they cannot find stenographers who can be trusted to transcribe the simplest letters except under strict supervision? We have institutions that purport to train the young especially for business life. They are not content to call themselves "business schools," but have adopted high-sounding titles, such as "Commercial College," "Secretarial Institute" and the like. Their prospectuses say that they teach English composition, bookkeeping and almost everything else that would prove useful in a commercial career. And yet

the communications they send out on their letterheads are frequently ungrammatical, poorly composed and badly punctuated. Their own account books are kept in so faulty a manner that it behooves every one having business dealings with them to retain receipts and vouchers at hand for convenient reference.

Nor are our colleges and seminaries in a much better position. Several generations ago the college man would slip a volume of Horace or Theocritus in his pocket for vacation reading. Now he resembles Shakespeare in the single particular that he has "little Latin and less Greek." The graduate who can construe a line from Homer or Vergil is a rarity. We are constantly given evidences of his lack of knowledge of the great classics of literature, of the vital underlying principles of science, and of the leading facts of current as well as ancient history. In place of these things, he talks familiarly of Nietzsche, Bergson or Karl Marx, of neo-Platonism, mysticism and sociology, and he has dipped enough into economics and theological and materialistic philosophy to have the peculiar terminology of these sciences come trippingly from the tongue.

It must be remembered that the above does not repre-

TERRA COTTA IN THE COLLEGE OF THE CITY OF NEW YORK

Cracking of the water table and spalling of the base courses. Much of the terra cotta work is in just as bad condition after eight years exposure

sent alone the pessimistic complaints of those who are opposed to higher education for the young. The most effective criticisms of present methods are from the deepest thinkers, who are interested in all pedagogic matters. Another fact must also be kept in mind; if these patent defects are to be found in our educational system they do not stand alone. They are merely a reflection of our general attitude and outlook on life. The keynote of much that we must deplore in the mod-

Of course when we refer to the older buildings we do not mean the "little old red school-house," so favored by the poets, nor any of the cheap and temporary structures in poor and sparsely settled communities, but rather the famous colleges and historic private schools. Nor is reference made to interior fittings, to conveniences of lighting and heating, and to sanitary appliances. It must be confessed that genuine progress has been made in these particulars, for we realize the importance of conserving the health of our youth. What we wish to contrast is the matter of externals alone—design, ornamentation and construction.

A New York newspaper has recently been publishing a series of illustrated articles showing "Glimpses of Famous Colleges." How refreshing and stimulating is the sight of these fine old buildings, erected of stone or brick, with their noble simplicity of line, their wise restraint of ornamentation, their dignity and honesty! They seem admirably suited to their purpose, to create, as it were, an atmosphere of culture and refinement. The modern school that copies after these exemplars, except in so far as modifications are necessary to adapt them to present day needs, is fortunate. But boards of education and their architects are rarely satisfied with such a building program as this would entail. There must be showiness and pretentiousness first of all. The design must be ornate, with enrichments and gingerbread work plastered all over the façade, and ornamentation clustering in every cranny. When the plans and specifications are set forth for bidding, the estimates may far exceed the appropriation. Cuts are necessary somewhere, but it is easier to cheapen the interior finish, omit some of the sanitary appliances, or turn all the ornamental work into terra cotta or artificial stone rather than simplify the design. The school board is fascinated by the vision of mouldings, bosses, finials, grotesques, garlands and festoons. They will permit no profane hands to trifle with that façade—save those of the maker of baked mud or the moulder of cement. Perhaps they may honestly believe that these cheap substitutes will really last like natural stone. On the other hand, they may figure that terra cotta and artificial stone will look well at first and last as long as they hold office. Their attitude may be that of Louis XV, when he gave to his advisers the cynical retort, "After me the deluge."

#### SCALING OF GLAZED TERRA COTTA

Disfigurement of the ornamental work in the College of the City of New York, standing only eight years

ern social structure is our fondness for show and pretence, and a neglect of the deep and vital underlying principles and of moral and intellectual truthfulness and sincerity. Putting aside all other phases of activity, if this view of our educational tendencies is correct, we shall expect to see the same false and superficial standards shown in the housing of our schools and colleges as in their curricula. Go through our cities and towns and study the modern buildings we have erected in which the education of our youth is to be conducted. Contrast these carefully with our more venerable institutions of learning, and see whether the signs of progress are as flattering to us as we fondly suppose.

The youth in our schools and colleges are at the most impressionable period of their lives. Every external influence counts for something in the formation of their character. Instructors take them in hand to teach them the eternal verities. They are to be guided along the paths of truth and sincerity and be made to feel that nothing is worthy or can endure that is not based upon integrity. And yet we herd them in buildings that are shams, that are gaudy at the expense of honesty, that will crack and spall and disintegrate and crumble almost before the workmen have received their final payment. The teachers may exhort their

pupils in the words of St. Paul: "Whatsoever things are true, whatsoever things are honest, \* \* \* think on these things." But the members of the board of education can only say: "Do not think too much on the imitation marble and stone we have used for the adornment of your school home, for these things are neither honest nor true." It would be a hundred times better if we put our children in buildings of the factory type of construction, so that they were sweet and clean and wholesome, rather than in showy palaces of stucco plastered over with cheap moulded ornaments.

The foregoing is merely a presentation of the ethical side of the question. The practical arguments should have only less weight. Schools and colleges are in reality workshops, and they should have the best qualities of this type of building. They should have beauty, of course, but it should be the beauty of utility and fitness, and of simplicity and dignity. They should be safe, sanitary and durable. What justification is there in the use of a material that cracks and spalls, where a cornice or a finial may crash to the ground without warning? What shall we say of copings with yawning joints that permit the water to seep down the walls? Finally, how shall we expect pupils to retain their pride and interest in a building in which all of the exterior ornamental work, blisters, scales, cracks, disintegrates, discolors and falls to pieces even before it is touched with age?

Words count for little unless they are backed up with proof. This magazine makes no charges against sham building materials until it is prepared to accompany them with the indisputable evidences of the camera. Examples of a mischievous use of terra cotta and artificial stone in educational buildings could be multiplied from many parts of the country. It may be sufficient in this connection to choose but a single instance, but very striking by itself. This is the group of buildings constituting the College of the City of New York.

The college is situated on Amsterdam Avenue between 137th and 138th Streets. It is a commanding site, occupying a slope on the side of a hill, so that the group of buildings can be seen from some distance. They present a striking spectacle owing to the boldness of the design and the contrast between the dark stone of which the walls are built and the light trimming. But they should be seen from a distance. The principal material of construction is the native New York rock, a mica schist. The trim is a white glazed terra cotta. If the terra cotta had been left in its natural color and finish, the result would have been better. But the attempt to imitate white marble has resulted most disastrously. The artificial material has been used for base and belt courses, for cornices, for all ornamental work, for sills and lintels, for door and window jambs and for quoins. In a very large proportion of the blocks, the glazing has crazed or blistered. In the latter case, the glazing has peeled off

in huge patches, showing the yellow clay beneath. In the older defects the porous clay has absorbed the smoke and impurities of the atmosphere until it is stained a disfiguring gray or black. It is impossible to give an exact idea of the present appearance of the

#### MORE BLISTERS IN TERRA COTTA

A large part of the ornamental work in the College of the City of New York is disfigured as badly as this example

buildings from any description. The photographs that we present hint at the gross disfigurement, but they reproduce such a small section of the walls and ornamentation that one cannot fully realize just how the buildings have suffered. Anyone who believes in terra cotta as a building material should visit the college and take the testimony of his own eyes.

In addition to this surface disfigurement, there are other defects that are more serious. Many of the blocks have cracked through a number of succeeding courses, while large pieces have broken completely away as shown in the illustration.

It should be stated in conclusion that the cornerstone of the main building was laid as recently as 1908. The city of New York has expended many hundreds of thousands of dollars on this group of buildings, which were intended to be a durable monument of the liberality of its citizens and their interest in educational progress. In the short time of eight years the work has grown to be an eyesore. Mica schist is not the highest type of building stone, but it can be depended upon to hold its integrity for generations. It was certainly entitled to a better trim than New York has provided for it in one of the city's great educational institutions.

### Mr. Kahn's Two Homes

Otto H. Kahn's new country home at Cold Spring Harbor, L. I., will, when completed, be one of the finest and most expensive suburban residences in the vicinity of New York. It will cost more than \$1,000,000, according to the plans completed by his architects, Delano & Aldrich. Mr. Kahn bought the property about two years ago and has given much attention to the details of his new house. Work began several months ago on the foundations, which are now nearly completed and represent a cost of about \$150,000. The house will be of brick and stone, three stories high, covering a lot 250 by 200 feet. In addition to the main house several outbuildings are included in the plans and an elaborate scheme of landscape gardening has been laid out. Mr. Kahn's estate at Cold Spring Harbor contains 350 acres. Several acres will be used for an eighteen-hole golf course. The architects expect that the work of construction will take fully a year to complete.

Besides his country home, Mr. Kahn is also building his new city home on the northeast corner of Fifth Avenue and Ninety-first Street, New York, opposite Andrew Carnegie's house. Mr. Kahn bought the plot from Mr. Carnegie about two years ago and recently began construction work on the house. It will have a frontage of nearly half a block on Fifth Avenue.

### Reorganization of the Kingwood Quarries Company

The Kingwood Quarries Company held its annual meeting in this city during the past month. The following officers were elected: President, James W. Flynn, of Kingwood; first vice-president, E. M. Lantz, of Kingwood; second vice-president, H. J. Russell, of New York; treasurer, A. M. McCrillis, of New York. Mr. Russell was also made the general manager and sole sales agent for the stone throughout the country. It was reported at the meeting that several contracts were in hand and that prospects were favorable for an

active and successful season. The company operates a quarry producing a yellow quartzite at Kingwood, W. Va., where there is also a mill and cutting sheds. The stone has been used in the metropolitan district for the Synod Hall at the Cathedral of St. John the Divine, for the trim of the Potter Memorial Chapel at the same cathedral, for the Russell Sage Memorial Building and for the interior finish of the post-office at Jersey City, besides several other important structures.

### A New Granite Center at Columbia

A movement is now on foot, with a good prospect of success, to establish a big granite manufacturing center at Columbia, S. C. While the general stone cutting business is as widely scattered as the building activity of the country, the monumental industry has always shown a tendency to centralize in the vicinity of some suitable granite deposit, as at Barre, Northfield, Quincy, Hardwick, St. Cloud and a few other points.

There are now establishing themselves at Columbia the concerns that are making use of the monumental granite quarried at Rion, S. C., only a short distance away. The former baseball park, a fine tract of land within the city limits of Columbia, has been secured, and on this modern and up-to-date sheds have been erected, fully equipped with modern machinery and compressor plants. Two big sheds have already been erected, those of the Columbia Granite Company and the American Granite Company, which are being operated with full crews of men. In addition to these, the Rion, Monti and Somaini monumental companies have been formed and have begun operation in rented quarters. The equipment of all these companies is modern and complete in every way. The stone that is worked comes from the big quarries at Rion. These employ fully 100 men, and are shipping out annually 100,000 cubic feet of granite. At the Rion quarries there is a single sheet of granite with a face 425 feet long and 30 feet in height.

## Some Stone Problems



At the recent annual convention of the International Cut Stone Contractors' and Quarrymen's Association, held in Atlantic City, Mr. W. M. McMillan made an interesting and suggestive address, reviewing the conditions that now confront the stone trade. Much that Mr. McMillan said had special appeal only to the members of the association, but many of his conclusions are vital to the entire industry. One of the first questions he took up was the relations of the stone men with the railroads.

This subject, he said, should receive serious thought because there are so many rate adjustments throughout the country which are out of line and never will be corrected except by concerted effort on the part of the shippers. The *true majority* should be the deciding factor when questions of railroad policy are discussed. While there are a number engaged in the cutting or finishing of stone in the quarrying district, yet there are many, many times as many engaged in the cities and towns throughout the country who have many times the money invested and therefore should receive the greater consideration.

If it is considered that the freight charge on stone in carload shipments will probably average as much as the value of the shipment itself, it will be realized what an important bearing the cost of transportation has upon the cost of stone to the user. It would entail a comparatively little expense proportionately if a traffic expert were employed to represent the association in matters of this character.

Mr. McMillan then discussed in detail the rates on stone shipments to and from various centers, showing

that the Interstate Commerce Commission had permitted an advance in rates to different points of from 9 to 23 per cent. He also analyzed the ton-mile earnings on some typical stone rates, with their very wide divergence, thus working a hardship to the consumer. The differential rate was also taken up, and examples of its unfairness given.

If the prediction that the whole country is about to enter upon a period of prosperity is borne out by actual developments, increased demand for stone may be expected, which should relieve to an extent the unjustifiable practice of making ridiculously low prices for both rough and finished material which now exists, said Mr. McMillan. However, if a period of prosperity is in store for us, it may well be anticipated that the labor situation will require attention. There is but one organization of union stone cutters in existence to-day and that is strongly entrenched.

If the International Cut Stone Contractors' and Quarrymen's Association does not conserve its forces so as to secure the greatest good for the greatest number, and so be able to promptly and effectively face possible strife originating in this quarter, then one of its fundamental reasons for existence is negated. It is to be hoped if any unpleasant circumstances arise that the deciding factor as to what had best be done will be the true majority, viz., the trade the country over, as they are many times greater in number and represent many times the investment of those who are located in the quarrying districts.

As a matter of self-preservation the Stone Cutters' Union is restricting the shipment of cut stone, and in



quite a number of cities its affiliations will not now handle finished stone from the outside for contracts of 6,000 feet and under. This limit may be increased and it may be given universal application. Naturally, the cut stone contractors in cities away from the producing districts benefit by this at the expense of, for example, the elaborate establishments in Bedford and surrounding districts.

To counteract such effects and in spite of them create living conditions for the plants at the source of material, it might be desirable to discourage shipping stone in the block form and instead ship it exclusively sawed. We realize that in some of the large cities, such as New York, there are large cutting plants that have considerable money invested in gang saws. But this can be somewhat discounted by the fact that many of these are fully occupied in sawing marble or other stone. Again, these can be employed in resawing stone. Also on account of the saving of freight in shipping sawed stone instead of blocks, it is unprofitable to saw stone at great distances from the quarries.

If developments in the next few years reduce the production of cut stone at the quarries to something like its former volume, then as a matter of course the many large and small establishments operating along those lines will be compelled to turn their attention to other channels of production.

In order to employ the present equipment of the cut stone plants in Bedford and surrounding territory, it is suggested that such units as planers be replaced with gang saws. The changed conditions touched upon would unquestionably result in many planers being bought by cut stone contractors in the cities. Perhaps many of the outside firms would be glad to exchange the gang saws which they now have for some of the planers which may no longer be useful in the producing districts; or in any event, such planers could be disposed of in other ways. The idea being to substitute saws for them and to put the shipment of Indiana limestone to outside contractors primarily on a *sawed stone basis*.

It is not to be understood from these remarks that we would advocate doing entirely away with the large cutting plants in the Bedford district, as these are a necessity. Only through them is it possible to introduce Indiana limestone in many large structures which call for great quantities of stone, and require that the work be completed within a limited time. Often these structures are erected at places where there are no cut stone plants, or if there are such their capacity is too small to enable them to compete. For instance, some of the capitols for the less populous states, also many court houses and post offices, would come into consideration here. The evil is caused not by the simple fact that there are some large plants in the quarry district, but rather because there are too many, and in addition to them numerous small ones, which, in order to secure

business, solicit even the smallest contracts anywhere in the country.

Before concluding, I wish to touch on another subject, viz., grading of stone. Much has been said of this, and all careful observers admit it should be done. Grading is done in all other lines of business, and it is the only proper way to treat purchasers fairly.

Indiana limestone can well be graded into about five classes, namely,

AA—Selected stone.

A—Good, first quality stone, such as is now generally sold as No. 1.

B—Such as is now called quarry run, or No. 2.

C—Coarser, poorer grained, or off-color material.

D—Special stone, so graded on account of undesirable qualities, flint, short lengths, honeycomb, etc.

Public inspectors, such as are employed in the lumber business, should be supported by a quarrymen's fund. and a book of rules issued and distributed among architects and other interested parties, describing how stone is graded and requesting co-operation by recognition of the official grading.

### A Marble Quarry to Resume Operations

It is announced that the marble properties of the Angels Marble Company, situated near Vallecito, California, will soon resume operations. A. B. Beall, of Sioux City, Iowa, and W. A. Vetter, of San Francisco, have been in San Andreas, Cal., arranging for the resumption of work. Mr. Beall was appointed as receiver to take charge of the affairs of the company five years ago and operations have been suspended during the receivership. It is expected that a sale of the property will be made to Mr. Vetter and associates. The company that opened the quarry failed to instal a sufficient equipment to handle large contracts. The transportation conditions were also difficult and it was found that it was impossible to carry on the work profitably with the limited capital at the disposal of the company. At the time of the construction of the Palace Hotel in San Francisco, after the earthquake and fire, the company had a chance to secure a contract to furnish marble for the interior work of the hotel, but was unable to guarantee delivery of the material on account of lack of equipment.

### A Cloth Made from Stone

A manufacturer in the north of Russia claims to be making a fabric from a gray stone of Siberian origin. This stone is susceptible, it seems, of being drawn into a fiber, and the cloth woven from it is said to be soft, durable and presentable. One report has it that the peasants of the district are generally wearing clothes made of it. There is nothing in the newspaper report of this invention to identify the material with asbestos, the fibres of which have long been woven for various purposes.

## Statues and Public Memorials

**I**T is generally conceded by judicious foreign critics that the United States has made remarkable progress in architectural art. It is true that we have passed through our bad stages, but we are not unique in this. Our simple and dignified colonial architecture was admirable, and still serves as an inspiration. The pretentious and preposterous "art" that followed the Civil War soon ran its course, and is fast passing into the limbo of forgotten things. It is unfortunate that one phase of our "artistic" endeavor took a form that is more permanent and bids fair to be with us for many years to come. This is to be found in our statuary and public memorials. Our cities have many statues of dead heroes that are distressing to every one of taste, and yet there seems to be no way of banishing them. A large proportion of the monumental work in our cemeteries is very poor in design, although it may be admirable in execution. Especially bad are most of the memorials to our dead soldiers and sailors. While we cannot but respect the sentiment that reared these monuments, we can only wish that it had taken some less conspicuous form.

In order to guard against the constant multiplication of these offenses against good taste, progressive cities have appointed art commissions to have supervision of these matters. This brings us better promise for the future, but it can give us little relief from our ill heritage from the past. Few would be bold enough openly to advocate the razing of statues and public memorials that a former generation lovingly reared. The most that can be hoped is that the worst of these may happily be banished to less conspicuous sites or be decently screened with trees and shrubbery. New York's art commission is working out a comprehensive and elaborate plan whereby all suitable sites for public memorials will be classified that an effort may be made to bring them into harmony with their surroundings.

It is particularly unfortunate that our national government should be a prime offender in this respect. The general idea of Statuary Hall in the Washington Capitol is an excellent one. We should have a Valhalla, where effigies of our national heroes can be displayed for the admiration and inspiration of our citizens. But how can any such plan rise superior to politics and log-rolling? To allow each state to erect two statues of its heroes regardless of its history and the number of its legitimate claimants to a place in a hall of fame, and to exercise no supervision over the choice of subjects or the execution of the statues is bound to result in such a ludicrous gathering as is now presented in Washington. No wonder that the newspapers jibe at the display.

A proposition has been made to remove the soldiers' monument at Des Moines from the state house grounds

to a more suitable location. The monument men of the state, at their recent convention, protested against any removal, on the grounds that the memorial would inevitably be injured in the process. This leads a local paper to say: "The whole monument is more or less inartistic. It is at least inexpressive of the sentiments desired to be conveyed. It is like most American art of a statuesque kind. Even the national capitol in Washington is disgraced instead of ornamented by the

ENTRANCE, H. L. PRATT RESIDENCE, GLEN COVE, L. I.  
Architect, James Brithe. Cut by James McLaren & Sons,  
Brooklyn, in limestone from the Indiana Quarries  
Company, Bedford, Ind.

likenesses of the great men of the nation. From an artistic standpoint what is called Statuary Hall in Washington is enough to make a novice in art ashamed of his country's tastes. If we are going to do such things at all we would better get great artists to do them for us. The making and the placing of a statue is a work that ought to be done right, if it is done at all, and most of the statuary in the country might better have been omitted than executed."

A Chicago newspaper chronicles the fact that a marble statue of Henry Mower Rice, the first United States Senator from Minnesota, has been placed in Statuary Hall, at Washington, between the effigies of John E. Kenna and Francis H. Pierpont. This inspires the writer to the following comment:

"How many people offhand can tell who John E. Kenna and Francis H. Pierpont were? Statuary Hall, in Washington, has in it a score or so of statues of men of whom modern folk, even the history readers, know little or nothing. Moreover, there are only half a dozen figures in the hall which artistically are worthy. Some persons have been mean enough to call Statuary Hall the Chamber of Horrors.

"A few years ago a statue of John C. Calhoun was placed in the hall by the State of South Carolina. Everybody knows who Calhoun was, and, moreover, the statue is a good piece of workmanship. Henry Cabot Lodge, of Massachusetts, delivered an address on Calhoun the day that the great South Carolinian's statue was received in the Capitol. Lodge, with full knowledge that the Memorial Hall was lumbered up with unknowns and with marble atrocities, spoke of Calhoun as 'standing there elbowed by the temporarily notorious and the illustrious obscure.' It was a fine, true phrasing of the situation."

### When the Stones Were Formed

An estimate published by Professor Charles Schuchert states that about 12,000,000 years have elapsed since the Carboniferous age, an age, as the name suggests, in which great deposits of carbon in the form of coal were being formed in many parts of the world. In the United States, this period has been divided by geologists into the Mississippian, Pennsylvanian and Permian epochs, of which the first-named is the oldest and the last-named the youngest. Professor Schuchert estimates that the Pennsylvanian epoch covered over two million years, and animal life is supposed to have existed on the earth fourteen million years before that time.

Geological periods are recognized primarily by the animals and plants that have lived in them, so that the study of fossils plays a very real and important part in the progress of geologic knowledge. Rocks of Carboniferous age, as shown by their fossils, have a wide distribution in several countries and they are apt to abound in these remains of plant and animal life. The fossil shells which are found in them, however, may

vary greatly from point to point, because the animals they represent lived in different periods of geologic time and in different regions in the Carboniferous ocean.

### Relative Value of Street Pavements

Alabama Street, in Atlanta, was recently repaved with small granite blocks laid in concrete. This has been approved as the best paving the city has ever had. Because of this work, the street committee of the Atlanta common council requested a report on the various kinds of paving from its chief of construction, in order that it might be guided as to the style of paving to be ordered in the future. The report of the chief of construction was as follows:

"Assuming that a small granite block pavement is laid under modern specifications, the life is forty years; a wood block pavement laid under modern specifications, the life is fifteen years; a vitrified brick pavement laid under modern specifications, the life is twelve years, and the life of a sheet asphalt pavement laid under modern specifications is ten years.

"On this basis I submit the following tabulation of cost:

"Small granite, on concrete, cost \$3.10 per yard; its estimated life is forty years, and the cost per yard per year would be  $7\frac{3}{4}$  cents.

"Wood block, creosoted, on concrete, costs \$2.90; its life is fifteen years and the cost per yard per year would be 19 3-10 cents.

"Vitrified brick, on concrete, costs \$2.50; its life is twelve years and the cost per year per yard would be 20 8-10 cents.

"Sheet asphalt on concrete, costs \$2.25; its life is ten years, and the cost per year per yard would be  $22\frac{1}{2}$  cents.

"Assuming that granite pavement at a cost of  $7\frac{3}{4}$  cents per yard per year has a value of one, the following table of values is obtained:

"Granite, 1; wood block, 2:5; vitrified brick, 2:7; asphalt, 2:9."

### An Interesting Exhibit in Stone Work

At a building show in Cleveland, a very interesting exhibit is made by the Ohio Quarries Company, producers of Buckeye Gray sandstone with quarries located near Amherst, Ohio. In order to give the public some idea as to the modern methods of working sandstone, the company has installed in their exhibit a large turning lathe, which is constantly being operated by an expert workman who produces from a piece of sawed stone a beautiful turned baluster. The visitor to the exhibit also sees large blocks of rough stone as they come from the quarry, a stone wall showing the various forms of finish, a stone sidewalk and an elaborately carved table, the labor on which alone costs several hundred dollars.

## Some American Marbles



PRESENT conditions in Europe have caused a decrease in imports of marble into the United States. Building activity in this country is also dull, but with the general revival of business it is to be expected that building operations will increase again and accordingly that there may arise a demand for domestic marble to supplement the decreased supply from abroad. There are several domestic marbles and limestones, suitable some for interior decorative work and some for exterior work also, that are entitled to broader recognition than they have heretofore received, writes G. F. McLoughlin in the Bulletin of Mineral Research for 1914, just issued by the United States Geological Survey. Some of these marbles have been used for a considerable time and others have been quarried only during the last two or three years.

Among the marbles of the Eastern and Southern States, those of Vermont, Tennessee and Georgia have been so extensively used throughout the country that no further reference to them is necessary. The white marbles of Massachusetts and Maryland have also been worked for many years, especially for buildings, and are well known. The marble in Cherokee County, N. C., has been quarried in increasing quantity during recent years. It includes a gray variety of medium grain and a white variety of fine grain. The marble of Alabama has also become well known in the eastern half of the country during recent years, but its extreme fineness of grain and its colors, which vary from pure white through cream and pink with more or less dark clouding, entitle it to recognition as a decorative stone, equal in appearance to any of the white or nearly white imported marbles. Other eastern marbles include the black marbles of Glens Falls, N. Y., and of Harrison County, W. Va., which may be used in place of the Belgian black marble.

Among the Central States west of Mississippi River limestone and marble suitable for interior decorative work are quarried in Arkansas, Missouri, Minnesota and Texas. The limestone quarried at Pfeiffer, near Batesville, Ark., is a gray fine-grained oolitic limestone, so compact that it takes a good polish and justifies its trade name "oolitic marble." It has been used for exterior work in some important buildings in the Central States, and its color and susceptibility of polish adapt it also to interior decorative work, such as wainscoting and balustrades. It lacks, however, the variety of coloring that gives beauty to many of the foreign marbles. Its superior hardness also adapts it to such uses as floor tiles and stair treads. The marble at St. Joe, Ark., has thus far been quarried only on a small scale. It is a medium-grained pink stone with blended shades of lavender and gray in places, with rather

frequent wavy black suture lines, and closely resembles some of the pink Tennessee marbles.

The Carthage stone of Missouri, although long known and used as a limestone in the Central States, has, during the last ten or twelve years, been used in polished slabs for interior work and deserves recognition as a marble. It is also sold for marble floor tiles. It is a semicrystalline to crystalline gray stone, traversed parallel to the bedding by sutures or "crow-feet," and has an appearance somewhat like that of the gray Tennessee marble. Its suture lines, however,

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Finished in Napoleon Gray Marble from the quarries of the  
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are mostly straight, rather than wavy, and are less attractive. For this reason slabs are usually sawn parallel to the sutures. The stone at Cassville, Mo., is of generally similar appearance, but has only been quarried to a small extent. The marble quarried at Phenix, Mo., is also generally similar to the Carthage stone, but its wavy suture lines give it a closer resemblance to the gray Tennessee marble. It is composed largely of shell fragments that have completely recrystallized and thus produced the texture of marble. It is known under the trade name of "Napoleon gray marble." It has already been used in many cities of the Central States and has been shipped as far east as New York.

The limestones quarried at Kasota and Mankato, Minn., have been used for both exterior and interior work. They are pink and yellow dolomitic limestones that take a dull and uneven polish and therefore do not conform to the definition of marble; but their appearance on dull polished surfaces is such that they have found favor for interior work in some very important buildings, including the new capitol at Madison, Wis. The pink stone is of uniform color, but the yellow is characterized by a mottling that adds greatly to its appearance. The yellow stone, although by no means comparing with the yellow Siena marble of Italy in

stone and marble. The marble includes several varieties of very fine grained to dense stone, susceptible of a good polish, and with colors varying from delicately blended shades of light yellow and brown to darker brown and, in some cases, reddish tones. Some of these varieties when polished have a peculiar and very attractive mottling of darker and lighter shades. Different samples resemble the Eschailon, Hauteville and Numidian marbles from abroad. One variety suggests the lighter shades of Swanton (Vt.) marble, and one variety, consisting of brown concretions developed around gastropod shells and uniformly distributed in a light yellowish-brown matrix, has an appearance somewhat similar to the newly developed "bird's-eye marble" of Utah. Another variety, of yellow to yellowish brown, finely specked with white, is, so far as the writer knows, of unique appearance. The beds have been exposed in nearly horizontal position at a few small prospect openings along a low terrace. They are for the most part rather thin, few of them exceeding two feet in thickness, but if a demand should arise for stone from two or three different beds, there appears to be no good reason why the deposit should not be quarried successfully. The thinness of the bed would require a modification of working methods employed at most marble quarries, but this fact should be no serious obstacle to development. Polished sample slabs of the marble seen by the writer range up to four feet in length and two feet in width. Larger sizes can probably be obtained, but the present openings are not sufficient to demonstrate the prevailing sizes of quarriable blocks.

Among the Western States Colorado, Utah and California contain marbles of striking appearance, which are being produced on a commercial scale. In Colorado the Colorado Yule marble is being quarried on a large scale, and has supplied stone for both exterior and interior work in central and even eastern cities. The stone as a whole is white and medium to fine grained with black and yellow grainings, rather thinly scattered through it. Three varieties of marble are produced, the white, the "Colorado cloud" with black veining, and the "golden vein" with yellow veining. Rough hand specimens of the white variety are practically identical in appearance with those of the Pentelic marble of Greece.

In Utah several marble deposits have been prospected, but only one (not including "onyx marble") has been recently worked on a commercial scale. This deposit is known as the "bird's-eye marble" and has been quarried only about a year and a half near Clinton, in Utah County. The stone consists of a very fine grained and dense matrix containing varying quantities of rounded or irregular concretion ("bird's eyes"). The colors are reds, yellows and browns, which blend into one another and which may all be present in a single slab. The concretions are all of brown color with conspicuous concentric rings. They may be very

#### STRIKING TURNED WORK IN INDIANA LIMESTONE

Representation of a steel spring, with base and ball cap, cut by L. J. Richards of the Salem Mills of the Indiana Quarries, Bedford, Ind.

degree of polish and variety of veining, is nevertheless adapted for many of the same uses as the Italian marble.

In Texas some marble has recently been quarried at San Saba, small samples of which have been sent to the writer. One of these is a very fine grained variety of creamy-white color mottled with pink spots and wavy veinlets, and, so far as the writer knows, does not resemble any foreign or domestic marble used in the United States. The other variety is a pale-brownish fossiliferous stone, somewhat similar to the Hauteville marble of France.

Another interesting deposit has been prospected at Lithograph City, Floyd County, Iowa, for lithographic

numerous in some slabs and scarce or absent in others. One variety of the marble is white with brown concretions, but no shipments of it had been made up to the fall of 1914. The stone has thus far found little use outside of Utah, but its appearance where used entitles it to much more than local consideration. It takes a very high polish and strongly resembles the darker shades of Numidian marble.

The marble property recently developed at Carrara, Nev., is said to produce stone of very fine and uniform grain, susceptible of a high polish, and of several varieties in color, including white, pink, yellow, cream with yellow veining, brown, green, blue, black and white, and jet black.

California contains, besides many extensive deposits of white to gray marble, two deposits of colored marble which have been worked on a commercial scale. These are the Columbia and Inyo marbles. The Columbia marble includes a number of fine-grained varieties of pale-pinkish, yellowish and light to medium gray colors, and coarser-grained varieties of medium to dark gray color. The fine-grained varieties are especially attractive in appearance, and do not closely resemble any domestic or foreign marble known to the writer. Samples of the yellowish variety give some suggestion of the lighter shades of Siena marble. The Columbia marble has been shipped as far east as Chicago. The Inyo marble is generally fine grained and rather hard, and includes varieties of white, white mottled with yellow, gray and black, and yellow and black. The yellow variety is somewhat similar to the Siena marble, but more closely resembles the Estremoz or so-called Lisbon yellow marble of Portugal. No shipments of this marble have, so far as the writer has learned, gone outside of the State.

Alaskan marbles have been, in recent years, extensively used in the Pacific coast and other western cities and as far east as Ohio. They are for the most part white mottled or veined with dark-gray or black, and their polished surfaces have a soft tone resembling that of clouded white Italian marble. Since the opening of the Panama Canal conditions have been favorable for extending the market for Alaskan as well, perhaps, as of Californian marbles, to the larger eastern cities.

### Handling Unexploded Charges

One of the most frequent sources of accidents in the use of explosives is from miss-fires. The removal of unexploded charges is always dangerous. At a recent meeting of the Brooklyn Engineers' Club, J. S. Langthorn said that by inserting the end of a hose or short length of pipe in a blast hole that has failed to go off, turning on a light pressure of air through a valve from the drill line, and withdrawing the pipe with the pressure on, the unexploded dynamite may be removed with safety. The work should be done with care, and too much air pressure should not be turned on. This method was always preferable to any attempt to drill a

new hole alongside the unexploded one. The paper, which outline the effective method used in handling explosives on the Catskill Aqueduct tunnels, and the discussion which followed, dealt with tunnel practice, where the holes in the heading are all drilled at an angle. No one can be sure where the end of such a hole, 8 or 10 feet from the face, is located, and when one of them has missed, it is dangerous to drill another hole anywhere near it. That this practice is much more dangerous than withdrawing the unexploded charge with care, especially where compressed air is used, was unanimously asserted by several tunnel engineers of wide reputation, who took part in the discussion of the paper. J. R. Healy, inspector of combustibles of the Bureau of Fire Prevention, stated that where compressed air was used as described, the charge followed the pipe out of the hole as though it were a piece of iron and the pipe a powerful magnet.

### FAILURE OF A CONCRETE ARCH CULVERT

This structure at Papillion, Nebraska, sixty-four feet long and eight feet wide, collapsed before it could be completed

### Huge Memorial to the Titanic Victims

Work is about completed on the national memorial statue that is to be placed when finished in Potomac Park, Washington. The gigantic figure, which represents the last inspiration of a departing soul and is intended as a memorial to the heroic men who gave up their lives in order that the women might be saved when the steamer Titanic sank, was designed by Mrs. Harry Payne Whitney and has been cut by John Harigan, sculptor, of Quincy, Mass. Mr. Harigan started to cut the gigantic figure out of a block of red granite weighing forty-five tons, from the Smalley quarry at Westerley, R. I. The size of the figure may be judged in that the span of the arms, from tip to tip, is fifteen feet. It will be mounted on a pedestal twelve feet square and ten feet high. The statue will be shipped from Quincy to Washington by boat.

# STONE

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AMERICANS have constantly to bear the criticism from our foreign visitors that our newspapers are too sensational. Unquestionably the charge is true, but we can take credit for the fact that we are thorough in the matter; we do not stop half way. The following is complete item in an English stone journal: "Quite a sensation was recently caused in Penzance when it became known that Mr. William John Pascoe, 41, proprietor of the monumental works in Causewayhead, had been found dead in his home under most tragic circumstances." To the curious American reader it would seem as if this said too much—or too little.

FOR some months past the organs of the stone trade in Great Britain have been publishing rolls of honor, giving the names of those connected with the industry who have gone to the front. These lists are now being replaced with the names of those who have been killed in action or been invalidated home. It has been a striking illustration of the fact that those in the stone industry have been second to none in love of country and supreme devotion to duty. The same spirit could be read in the columns of our German stone exchanges, as long as they continued to come to hand. The leading French journal devoted to stone matters happened to be printed in Belgium, and naturally this has not appeared since the outbreak of the war.

A RATHER amusing incident attends the purchase by Erie County for \$700,000 of the interests of the City of Buffalo in the city and county hall in that city. In the common council chamber are marble tablets containing the names of former aldermen, councilmen and other officials, each of whom contributed \$10 to have his name chiseled where it would remain for public inspection as long as the building lasted. Inasmuch as the tablets contain the names of no county

officials, the supervisors naturally think they should be removed. The question of the final disposition of the tablets now arises. One of the former aldermen, blessed with a sense of humor, suggests that, as they mark the passing of the old system of government, it would perhaps be appropriate to transfer the tablets to the historical museum, along with other antiques. To the average taxpayer it seems that there are altogether too many tablets in public structures enshrining the names of politicians and petty officeholders. However, they are seldom as considerate as these Buffalo men, who paid for their enrollment out of their own pockets!

A MONTH or two ago we recorded in these columns a suit brought in the English courts by the vicar of a church against a monumental sculptor. The clergyman claimed that the latter had erected a stone in the churchyard containing the maker's name offensively displayed. It was alleged that the name was as conspicuous as the inscription on the monument, and the court ordered that the offending name be chiseled off, or that the headstone be removed from the grave. The learned judge took the occasion to deliver a little homily on the ethics of advertising in churchyards. That was one side of the case, and it seemed convincing on the face of it. Now comes the other side, and it throws a rather different light on the whole matter. The "large black letters constituting a glaring advertisement," in the words of the complaint, prove to have been nine-sixteenths of an inch in size and to have been placed in an inconspicuous position. What is more, two vicars of neighboring churches write to the sculptor to the effect that he had erected the majority of the monuments in their churchyards for many years past, and always with the utmost satisfaction. At the same time they had been glad to have him affix his name to the stones as maker, as this seemed to be the best guarantee of careful and conscientious workmanship.

REPRESENTATIVE JAMES M. LYLE, of Gloucester, is pushing a bill in the Massachusetts legislature providing that all stone and marble to be used in the construction of public buildings in Massachusetts shall be cut and dressed in the commonwealth and that native stone shall be used wherever possible. This is a matter that concerns Massachusetts alone. Quarries and stone workers elsewhere may lose a possible market if this law is enacted, but they have no real grounds for complaint if the state determines to foster native industries without taking too strict an account of cost. Therein the Massachusetts movement differs from much of the agitation for native stone which figures so largely in the public press. As a general rule, states, cities and towns, as well as individuals, take advantage of the most reasonable markets in purchasing their building materials. But when the national government proposes



to erect a federal building these people demand that native stone shall be favored without any regard to cost. The government specifies any standard stone that will pass the tests and measures up to the requirements, and it calls for alternate bids. There is always the chance for local quarries to compete if their stone is of average quality and they can meet prices. But when the government follows the example of the town and state affected and determines to get the best bargain for its money, a cry rises to high heaven that there is an unfair discrimination against local interests. Those who shout the loudest are generally the last ones who would pay one added cent out of civic pride or to foster native industries. If the citizens of a state, individually and through their legislatures, give a preference to local stone there will be little need to call upon the national government for help.

ONE feature of the great European war in its relation to the stone trade we have not seen touched upon. Much of the severe fighting in Belgium and France has been in the quarrying districts. It was reported early in the contest that some of the great quarries had been utilized as cannon pits and as shelters for the soldiers. During the recent terrible struggle in the Verdun sector the French took refuge in a deep cave at the rear of a quarry at Louvemont, and the Germans made repeated efforts to dislodge them. During all of this fighting there has been a continual rain of shells loaded with the most powerful explosives known. During the first week of the fighting at Verdun it is stated that the Germans fired no less than 3,000,000 shells. Eyewitnesses tell of the terrible havoc wrought by these shells, as well as by the mines that are continually exploded. Vast craters are blown out of the rock and soil, and fortresses of steel and concrete are crumbled into fragments. Every stone man is aware of the fact that a single careless explosion of dynamite may ruin an entire deposit of valuable stone. It would seem, therefore, that this ceaseless hail of shells must have shattered all the ledges of stone within their radius so that there can be no possible utilization of the material in the future for building or decorative purposes. Of course, all of this is of small consequence in comparison with the terrible loss of life, and yet it serves to illustrate the awful waste of war. The struggle between Italy and Austria has centered in the Dolomites, a range of mountains of particular interest to scientists because of its bearing on geological problems, but that has never been a quarrying field. If the fighting had shifted further to the south, to the Apuan Alps, all of the civilized world would have been directly affected, for from the quarries at Carrara, Massa and Pietrasanta some of the most famous marbles used by man have been taken since the beginning of the Christian era. The quarries in Germany and France from which America has drawn supplies in the past are outside of the range of the present struggle. We have

used considerable Belgian marble, and of course the production has been absolutely suspended since the outbreak of the war. Whether these quarries have been ruined, no information is yet available.

THE National Americanization Committee, with headquarters in the Astor Court Buildings, New York, has undertaken a work that should make strong appeal to all who are interested in the welfare of the working classes. The membership of the committee includes some of the most eminent and public-spirited citizens of the country, such as Cardinal Gibbons, Elbert H. Gary, Myron T. Herrick, General Leonard Wood, Nicholas Murray Butler, Thomas A. Edison, Mrs. Cornelius Vanderbilt and others. The committee is now conducting a competition wherein prizes aggregating \$2,100 are offered for plans, sketches, grouping and arrangement for the housing of immigrants in industrial towns. In the classification of the prizes the committee has in mind a new community produced by a new industry with a consequent need of supplying dwellings for a large number of employees. A considerable portion of these employees will be needed permanently; the rest, as the construction gangs, from two to five years only. Another group of prizes is offered for a satisfactory substitute for the derailed freight and cattle cars now used to house construction gangs on railroads. In announcing the competition, the Committee calls attention to the fact that new communities clustered around new industries are being produced in this country with phenomenal rapidity. It is the small industrial town at present, not the large city, in which the "congestion" problem of the country is centered. Men flock by thousands to places where there are plenty of jobs—but no dwellings. In one New England town, families are being "evicted" not because they cannot pay rent, but because they cannot get houses for the rent they can pay. A large percentage of these workmen are immigrants who have no way of creating American standards of living for themselves. If such standards are not provided for them, and insisted upon, groups of immigrant workmen are bound to follow various Southern European standards of living and customs, vitally affecting social health and prosperity. The community that results from these conditions cannot be an American community.

### Embargo on Swedish Granite

A royal proclamation has been issued in Great Britain prohibiting the import into that country after March 1, except under Board of Trade license, of a large number of articles, including stones and slates. The Aberdeen granite merchants are seriously concerned over the embargo on the importations of Swedish granite. The British Legation at Stockholm has notified ship owners that return cargoes of coal and other necessities to Sweden will be given only in



exchange for pit props and iron ore. Inasmuch as a considerable part of the Aberdeen granite trade is working of Swedish granite, much of which is exported to America, the manufacturers have made strong representations to the government, but without avail as yet. The trade was hard hit by the war, even without this new regulation.

At a meeting of the Quarrymen's Union at Enderby, Eng., it was stated that the war had caused a terrible slump in the curb and paving block trade. In Wales alone over 500 block makers had recently been discharged.

### A New Barre Granite Plant

One of the latest and most improved granite manufacturing plants in Barre has recently been completed, and is now in active operation. This is the plant of Shield & Mills in Burnham's Meadow.

The main shed has lateral dimensions of 182 and 40 feet with an altitude that permits of the introduction of interior crane equipment and contributes materially to the ventilating facilities of the plant. There are two wings, each having wall dimensions of 24 and 32 feet. Three polishing wheels have been installed. Facilities for shipping finished Barre granite could not easily be improved. The plant is located on a site just north of the Hoyt & Milne shed, erected last summer, and the Brown & Carroll plant, which was the first of the more modern plants in that section of Burnham's meadow. A spur of the Central Vermont Railroad has been extended to the Shield & Mills plant so that there will be adequate shipping facilities.

### Strike of Quarry Laborers

Several hundred workmen, mostly foreigners, employed in the quarries of the Blair Limestone Company, at Blair Four, near Altoona, Pa., struck during the past month. There was considerable disorder, and the sheriff was compelled to take charge. The demands of the men included about a 14 per cent. increase in wages, a new checking system and the dismissal of the company's checkweighman and his clerk.

The strongest demand was made by the strikers for the change in the check system, desiring a return to the old plan of having a leader in each gang take the time checks to the office at the close of each day, instead of compelling each employe to carry in his own check, necessitating a long walk after quitting work each evening. The company had made the change because it was alleged the gang leaders, in turning in the checks, could turn in full time for a man who had quit work an hour or two early, or could even turn in checks for men who had ceased to be employes.

It was reported that the company might close these quarries indefinitely, but officials say that operations will be resumed as soon as the disorder ceases.

### Duty on a Marble Mantel

A high rate of duty is fixed on a marble mantel copied after a mantel in the Doge's Palace in Venice, imported to New York by the Halle Bros. Company, according to a decision handed down by the United States Court of Customs Appeals. This mantel was taxed for duty by the customs collector at the rate of 45 per cent. ad valorem under paragraph 98 of the tariff act of 1913 as a manufacture of marble. The importers, who brought this

mantel here to be used in furnishing an Italian room in their store, protested to the Board of General Appraisers against this assessment, claiming duty at the rate of but 15 per cent. ad valorem under paragraph 376 as a sculpture. The board sustained this contention and the Government appealed to the higher tribunal. It was brought out at the trial that the mantel was ordered from an Italian named Orestes Adriani in the little town of Pietrasanta, Italy. It appears that this Adriani has gained a reputation as a reproducer of ancient pieces and that many beautiful things in Florence have been reproduced by him. Judge Barber of the customs court, in referring to this testimony, writes: "So far as appears, the mantel in the Doge's Palace, of which the importation is said to be a copy, may not have been the work of the sculptor. The fact that it is of the type regularly on sale to any purchaser, coupled with the failure to show that Adriani is other than a reproducer of ancient pieces tends to the belief that it is a manufacture of marble as assessed. While it may be ornamental and beautiful, we cannot say upon the evidence that it rises to the standard of a sculpture, and unless so it is not a work of art within paragraph 376."

### New York Monument Men Meet

The eighth annual convention of the New York State Retail Monument Dealers' Association was held at Troy, N. Y., during the past month. The following officers were elected: A. P. Tayntor, New York, president; James Lauder, Binghamton, vice-president; W. C. Hinman, Syracuse, secretary; Albert Jarvis, Ilion, treasurer. The association declared its opposition to the plan of community mausoleums and the making of interments in concrete structures built above ground. It recommended further legislation providing for approval by the State Health Board for the plans of community mausoleums before they can be erected.

### Convention of Michigan Monument Men

The annual meeting of the Michigan Retail Monument Dealers' Association was held at Grand Rapids, Mich. the past month. The following officers were elected: President, E. T. Desjardins, Lapeer; Vice-President, John Ironsides, Hastings; Secretary and Treasurer, A. W. Rickard, Traverse City; Chairman of executive committee, E. T. Keys, Kalamazoo. The next meeting of the association will be held in Detroit.

### Business Brevities

The Pocahontas Memorial Association is raising a fund of \$10,000 for the purpose of erecting a monument to the memory of the Indian Princess Pocahontas.

Emlen Hare Miller, of Philadelphia, Pa., has sent a letter to the governor of every state asking co-operation in a plan for the erection of an impressive monument, costing not more than \$50,000, in memory of the American citizens who lost their lives in the destruction of the Lusitania.

The Grace Baptist Congregation of Netcong, N. J., has just erected a new church building with a tower constructed entirely of field stone.

The Green Stone and Quarrying Company and the Adolph Green Contracting Company, of Sawyer, Wisconsin, near Sturgeon Bay, have consolidated. The elder Mr. Green will withdraw from active participation and the affairs will be handled by his son.

A public crusher to be established at Spokane, Washington,

to be operated by the unemployed married men of the city.

The Suburbs Holding Company has sold the Tuckahoe Marble Quarry, comprising about twenty-two acres, to the Emerson-Norris Company.

The city of Binghamton, New York, will install a twenty-five-ton stone crusher in order to prepare material for road building. The Department of Public Works will also purchase several automobile trucks for conveying the stone and also for taking the men to and from the plant.

What is believed to be the largest conveyor built in the world, 893 feet long and thirty inches wide, has been made for the Ohio Stone Quarry.

The Dittlinger Lime Company, of New Braunfels, Texas, has increased its capital stock from \$100,000 to \$150,000.

The Michigan Limestone and Chemical Company, of Presque Isle County, Michigan, has increased its capital stock from \$2,500,000 to \$4,450,000.

Owing to the European War, there is a great scarcity of potash in this country. The Security Cement and Lime Company, of Baltimore, Md., is planning the erection of a new potash recovery plant in order to save the large amount of potash which is now a waste product in cement making. The estimated cost of the new plant is \$50,000.

According to the report of the New York State Industrial Commission, employment in the stone trade was markedly less during January than in December. Despite this loss, however, the trade as a whole was doing much more business than a year ago.

The plant of the Fenton, Barnes & Sumption Sand and Gravel Company, in the Otay Valley, California, was washed away during a recent flood and nothing left to mark the site of the plant. The plant was erected at a cost of from \$50,000 to \$60,000 and is an entire loss. The company will soon begin the erection of a new plant.

A monument to the memory of the First Defenders will be erected in West Park, Allentown, Pa. It will be of granite and bronze.

A movement is on foot for the erection of a memorial at New Hartford, N. Y., in the memory of Nathaniel Stacy, who established the first Universalist Church in New York State, in the early eighteen hundreds.

The American Magnesite Company and the E. J. Lavino Quarry Company will rebuild their plants at Plymouth Meeting, Pa., recently destroyed by fire.

The Thomas Barber Camp will erect a memorial to the Spanish War Veterans at Binghamton, N. Y., costing nearly \$15,000. This is said to be the largest and most costly memorial erected in the United States to the soldiers of the last war.

F. W. Kassebaum & Son, marble and granite dealers, of Aurora, Ind., have reduced their common stock from \$7,500 to \$5,000, and increased their preferred stock from \$5,000 to \$7,500.

The Columbia Quarry Company, of St. Louis, Mo., has increased its capital stock from \$100,000 to \$300,000.

The Euclid Stone and Brick Company, of Cleveland, has increased its capital from \$50,000 to \$125,000.

There will shortly be filed at Atlanta, Ga., an application for a charter for the Stone Mountain Memorial Association. The purpose of the organization is to provide for the carving of a Confederate memorial on the face of Stone Mountain.

### Government Work

Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until March 17 for the construction of the post office building at Charles City, Iowa, and until April 6 for the construction of the United States post office building at Valley, N. D.

The contract for the construction of the United States

post office at Moberly, Mo., has been awarded to the Original Cabinet Company, of Evanston, Ill., at \$31,450.

### Notes from the Stone Fields

#### Marble and Granite

In 1912, a snow slide destroyed a portion of the plant of the Colorado Yule Marble Company, at Marble, Colorado, entailing a loss estimated at \$100,000. In order to guard against a repetition of this disaster, the company last summer built a wall of marble, 30 feet in thickness and 75 feet in height extending along the bank of the river beside the finishing plant for a distance of nearly a quarter of a mile. The wall was built of rejected marble blocks, many of which weigh from 15 to 25 tons. The work cost the company about \$100,000 in labor of setting the blocks in the wall and, no doubt, forms the most unique snow guard in the United States. Several minor slides that have run so far this winter have struck the wall without affecting it. Since the first of the year, seventy-two inches of snow have fallen in the valley, the amount on the mountain being much greater.

The affairs of the Worden-Crawford Monument Company, of Batavia, N. Y., are being wound up. The plant in Evans Street will be occupied by the newly incorporated Worden-Gilboy Company.

The new Grace Methodist Church at St. Johnsbury, Vermont, was opened for worship the past month. It replaces the one burned a year ago. When completed, it will be one of the finest and best equipped churches of Vermont. The building is of New Hampshire granite, with trimmings of Hardwick granite.

The Stotzer Granite Company, of Portage, Wis., has purchased the stock and business good-will of Turner & Blumenthal, Granite and Marble Dealers, of Columbus, Wis. The business hereafter will be consolidated under the corporate name of the Stotzer Granite Company, of Portage, Columbus and Milwaukee. The granite company recently erected at Portage one of the largest granite cutting plants in the state, where all work is being done by pneumatic tools, operated by electric power. This change will make it one of the largest and strongest institutions of its kind in the middle west.

The Wisconsin Granite Quarry at Redgranite, Wis., began operations the past month after a long idleness due to unfavorable weather conditions. There is a great demand for paving blocks and the work will be pushed to the limit while favorable conditions exist.

Plans are now under way whereby the George Wolf Granite Works, of Appleton, Wis., will be consolidated with the Fox River Valley Marble and Cut Stone Works, of the same town. The plans contemplate doing most of the rough work at the latter plant while the general office and most of the polishing will be done at the former plant.

The monument to be erected by the State of South Carolina to the memory of Thomas McKie Merriweather, who lost his life in the Hamburg riot, has been completed and will in the near future be unveiled at North Augusta. The monument is the work of Owens Brothers, of Greenwood, S. C.

R. S. Ballantyne has been appointed manager of the Mt. Nebo Marble Company, of Salt Lake City, Utah. The company has opened red granite quarries in Sevier County, Utah. The company has also found a light cream marble near Thistle, and a marble somewhat similar to the noted Greek Skyros.

The Empire Mausoleum Company, of New York, will erect a \$100,000 mausoleum in Fern Dale Cemetery midway between Gloversville and Johnstown, N. Y. The

structure will be about 150 feet long and 40 feet wide. The exterior will be of granite and the interior polished marble.

F. M. LeCount, proprietor of the Hartford Granite & Marble Works, of Hartford, Wis., has sold the shop and business to William Gehl.

The Webb Pink Granite Company of Worcester, Mass., has just closed two large orders totalling about \$100,000, which will keep the plant busy for several months. One of these is for a public service building in Baltimore, and the other is the Grand Rapids Savings Bank at Grand Rapids, Mich.

Complaint is made that the new \$2,000,000 post office and federal building at Denver, Colo., the interior of which is finished elaborately in marble, has been badly defaced with ink spots which it is impossible to remove. The federal prosecutor threatens to punish the vandals who deface the building if they can be detected.

The exterior work on the new public library at Savannah, Ga., has been completed and the contractors are now ready to take up the interior finish. The building is in the Grecian style and is built entirely of granite.

Frank Hill & Bros., marble workers of Riverhead, L. I., will erect an elaborate mausoleum, said to be the finest thing of its kind on eastern Long Island, for Walter Debevoise, of Brooklyn, who owns a summer estate at South Jamesburg. This will be erected by the families of Mr. Debevoise and his father-in-law, the late Captain Edward Downs.

The St. Paul Mausoleum Company, of St. Paul, Minn., will erect a large community mausoleum in Forest Cemetery, at St. Paul. It will be erected of granite with a polished marble interior. The building will contain approximately 1,300 compartments.

The Presbrey-Coykendall Company of Barre and New York has completed plans for the enlargement of its stone shed at Barre, already one of the largest and best equipped manufacturing plants in that district. The plans call for an extension of 110 feet, which will give accommodations for more men and increased machinery to be purchased. A large new travelling crane will be installed to supplement the derrick apparatus.

The Utah Consolidated Stone Company has closed down its plant at Midvale, Utah, and its yards at Salt Lake City. This is on account of the completion of the church office building in Salt Lake City. The company announces that the further it gets into the mountain of granite in Little Cottonwood, the better proves to be the quality of the stone.

The Washington Quarries Company has recently been incorporated with the idea of developing large deposits of marble in Stevens County, Washington, that is controlled by Dr. Frederick C. Freemantel and his associates.

The field secretary of the Granite Paving Block Manufacturers' Association of the United States has written letters to the city officials of Watertown, N. Y., asking why it is proposed to pave the public square with wooden blocks, when granite blocks of excellent quality can be secured at Alexandria Bay, almost within the distance of wagon hauling.

The Schneider Marble Company is increasing its force of workmen at its plant in Americus, Ga.

The city of Norfolk, Va., has granted permission to the Virginia Railway & Power Company to pave between its tracks with Durax granite blocks. The city engineer declares that the use of wooden blocks on the city streets had been proven very unsatisfactory, owing to the fact that they give an uneven surface and do not last long.

Work on the National Lincoln memorial, now in process of construction at Potomac Park, Washington, after

plans by Henry Bacon of New York City, is about half completed. The exterior is of white Colorado Yule Marble and the interior of limestone.

The Bulgarian Government will erect a marble monument to commemorate the meeting at Nish of the Kaiser and King Ferdinand of Bulgaria.

The contract for the marble for the walls of St. Joseph's chapel in the new Catholic Cathedral, at St. Paul, Minn., has been awarded to E. M. Lohmann of that city for \$17,953. The columns and pilasters, will be of Brèche Violette, and yellow Siena, while the floors will be of Eastman Cream and pink Tennessee marble. Because of the difficulty in getting marble from Italy, no time limit has been mentioned in the contracts.

Paul Nickle, who with his brother conducts a large marble and granite plant, employing about 150 men, at Marinette, Wis., will open a branch at Superior, Wis., to be operated in conjunction with the Marinette plant. A property has been secured on Tower Avenue, between Eighteenth and Nineteenth Streets.

The Rockport Granite Company has asked the State authorities for permission to extend the breakwater that it now maintains off Hodgkins Cove, Gloucester.

Announcement is made that the DeRegibus Granite Company, of Barre, has purchased the plant of Rizzi Brothers, in that city. Arthur Rizzi has also been taken into the new firm. Stephen Rizzi expects to have operating quarters in the plant which he has sold, but it is said that he contemplates the erection of a new granite manufacturing plant in the near future. The firm has been doing a class of heavy monumental work and a necessity has been felt for a plant adapted to such orders.

The entire granite industry at Hardwick, Vt., is being conducted under a new bill, as there was no suspension of work following the expiration of the old agreement on February 29th. The new bill calls for \$4.00 a day for the cutters and will expire on March 1, 1920. About 350 men are affected and an official of the Woodbury Granite Company estimated that the increase is the payroll of that concern alone would be \$100,000 a year. At the time of writing, the Bethel end of the Woodbury Granite Company had not yet come to a settlement with its employees.

The Wisconsin Granite Company is installing improved electric machinery as its plant at Redgranite, Wis. A compressor plant and an electric hoist and derrick are among the improvements.

The Southern Onyx Company's property at Glasgow Junction, Ky., has been sold by the sheriff to W. Logan Porter, president of the Glasgow Branch Railroad. The company was organized by Indianapolis capitalists seven years ago and a quarry was opened. The cost of getting out a stone was so heavy that the work was abandoned.

The Northern Granite and Stone Company, W. P. Hurst, president, has opened offices on the eighth floor of the Leader-News Building, Cleveland, Ohio. The company represents quarries at Redgranite, Ableman, Berlin, and Utley, Wis., Alexandria Bay and Wesley Island, N. Y., Granite Quarry, N. C., and Stone Mountain, Ga.

#### LIMESTONE AND SANDSTONE

The Midvale Steel and Ordnance Company has purchased the entire outstanding shares of the Cambria Steel Company of Philadelphia. The latter company operates the Juniata Limestone Company, Ltd., a large producer of limestone for fluxing purposes.

Lime hydrating plants in the United States increased from 30 in 1916 to 82 in 1914 and their output from \$479,000 to \$2,240,000.

A final decree in the suit of the Government to declare the Cleveland Stone Company a combination in restraint

of trade, has been entered by United States District Judge Clarke, of Cleveland. The decision of the court is that the company is not a monopoly in violation of the anti-trust act.

A bill is before the South Carolina Legislature providing for the quarrying and grinding of limestone and marble by convicts in that State.

The Sturgeon Bay Stone Company, of Sturgeon Bay, Wis., reports that the business during the past year was very satisfactory, although the season was short. The company during the past year has added sixty-nine acres to its holdings. The company has operated quarries on this property for the past 15 years.

The treasury department has decided to build the new post office at Hornell, N. Y., of limestone and work will be started just as soon as the weather permits. The cost of the building will be \$61,863.

The Armour Packing Company will erect a new building in South Omaha, Neb., which is expected to be one of the finest buildings of its kind occupied by any one firm in the west. The exterior will be of limestone and the cut stone contract has been awarded to A. Schall Company of Omaha. The interior of the building will be elaborately finished in white marble.

E. H. Lyons has been elected president of the Standard Lime and Stone Company of Fond du Lac, Wis. The company reports a successful year of business.

An explosion of dynamite in a limestone quarry in Guernsey, Iowa, the past month caused damages estimated at \$5,000. Several buildings and the tramway were wrecked and the explosion was heard thirty-five miles away. No person was in the quarry at the time.

The Limestone Products Company, which has installed a plant a few miles south of Siloam Springs, Arkansas, is putting in machinery for the manufacture of lime. There is a strong local demand for the product.

#### SLATE

According to a dispatch from Belair, Md., the well known Peach Bottom Slate Quarries, located at Cardiff, Harford County, Md., have been purchased by William T. Shackelford, of Baltimore, for the benefit of the first mortgage bondholders of the slate company for \$20,000. The sale was made by the Union Trust Company of Baltimore, by authority of a decree of the United States District Court.

A slide of rock occurred in the quarry of the Blue Valley Slate Company, about one and a half miles north of Slatington, Pa., during the past month. The accident was the result of the recent mild weather which caused a thaw in the ground. A single stone weighing about a ton fell into the pit and it killed one man and injured several others.

The suit of the Columbus Slate Company against the American Sea Green Slate Company of Granville, N. Y., will be tried at Utica in April. It is contended that the American company restrained trade in violation of the federal laws. About \$100,000 is involved in the suit.

A large block of slate that was being hoisted in the Prudential Slate Quarry near Berlinsville, Pa., fell the past month owing to the breaking of a chain. One of the workmen was instantly killed.

#### Quarry Notes

Edwin Duffey, New York State Commissioner of Highways, recommends the operation of a stone quarry at the Great Meadow Prison. He says that a plant could be erected for \$40,000 which would have a capacity of 500 tons daily and could be used in connection with highway

and canal work. "No commercial stone quarry of importance is in operation at present in that section of the State," says Mr. Duffey, "and on the other hand, the State requires for construction work a very large quantity of stone annually."

The county of Orange, N. Y. has begun its fight in the condemnation proceedings in the matter of the property of the Storm King Stone Company, which is desired for the building of the Storm King Highway. The county attacks the claims of the stone company, which place the value of the property at from \$400,000 to \$500,000. The county alleges that the company was incorporated and



CHURCH OF ST. PAUL, ISSOIRE, FRANCE

A striking medieval stone church with inlaid ornaments.  
From a sketch by J. Tavenor Perry, in the  
*London Architect*

began its work with the knowledge that the condemnation proceedings were contemplated.

The government stone quarry at La Moille, which has been operated by the United States for some fifteen years, past, to furnish the stone used in much of the wing dam building in that section of the Mississippi River in improvement work, is now being abandoned.

The Schwind Stone Company, of Baltimore, Md., will erect ten two-story dwellings at its quarry for the accommodation of workmen.

George S. Tucker has sold to Edward P. McManus for \$17,500 his interest in the firm of McManus & Tucker, which for many years has operated a stone quarry north of Keokuk, Iowa. Mr. McManus is at present postmaster at Keokuk. He has served in the State Senate for a number of terms and is well known throughout Iowa.

Some time ago John McShade sold 200 acres of land four miles west of Brandon, Iowa, to a syndicate company from Stone City, Iowa, for the consideration of \$200. The land proved to be underlain with a valuable deposit

of stone and a gang of fifteen men has been working there for several months. The output is being used for road work.

A cave-in at the quarry of the Royer Stone Company at Swatara Station, Dauphin County, Pa., the past month killed three men and injured four. It was the most serious accident that had occurred in this vicinity for years.

A suggestion is made that a quarry and crushed stone plant to be operated by convict labor, be opened at the State Prison at Marquette, Mich.

The town of Canajoharie, N. Y., will purchase a stone crusher in order to get out material for highway construction.

The Massachusetts Broken Stone Company has petitioned the city council of Salem, Mass., for permission to resume business. The residents of the district have long fought against the conduct of work of this kind within the city limits.

It is reported that Nash Brothers, of Chicago, contemplate opening the old stone quarry at South German town, Wis., which has not been operated for some years. If the quarries are opened they will give employment to about 40 men.

The Iowa State Board of Control has purchased 141 acres of land in Lyons County, Iowa, for the purpose of opening a quarry for prison industry, to supply crushed rock for the improvement of Iowa's highways. The property contains a large deposit of the so-called Sioux Falls granite.

The quarrymen producing crushed stone in Wisconsin are planning the formation of a state organization. It is hoped that a meeting can be held at Sturgeon Bay this summer.

### Construction Notes

Contracts have been let for the erection of the new Dental Dispensary at Rochester, N. Y. The building will be of white marble and tapestry brick.

The city of Butte, Mont., will erect a \$225,000 passenger station which is expected to be one of the largest and handsomest in the State of Montana. It will have a frontage of 150 feet, with a clock tower 100 feet high.

C. C. Dula, vice-president of the American Tobacco Company, will build a granite garage in Yonkers, which will be the most costly building of its kind in the city.

Plans have been completed by State Architect Lewis F. Pilcher, of Albany, for the new armory for Cavalry Troop H, to be built at Rochester, N. Y. It will be of stone and brick construction.

The University of California will erect a hospital building in Berkeley, Cal., costing \$615,000.

C. B. Norton will erect a residence at Kansas City, Mo., of Carthage stone and stucco after plans by Whitman Dart.

Work has been begun on Druid Hills, Atlanta, Ga., on Lamar School of Law for Emory University. It will be two stories front elevation and three stories back and will be entirely faced on all sides with white Georgia marble. The marble used in the construction is the gift of Col. Sam Tate of the Georgia Marble Company and comes from the quarries at Tate, Ga.

A two story bank and office building will be erected on the southeast corner of Fifth Avenue and Forty-second Street, New York City. It will be 73 feet on the avenue by 96 feet on the street with a facade of limestone, brick, terra cotta in the French Renaissance style. It will be known as the Astor Trust Company Building and the banking quarters will be on the second floor.

Plans have just been completed by Miles E. Miller of

Salt Lake City, Utah, for a stone and brick chapel with a seating capacity of 1,000 to be erected at Parowan, Utah.

George C. Rossell, of Rochester, N. Y. was the lowest bidder for the limestone construction of the new post-office at Batavia, N. Y. His figure was \$57,993.

R. Clinton Sturgis, 120 Boylston Street, Boston, Mass., is preparing plans for a hospital for the Knox Hospital Corporation at Rockland, Maine.

Contracts will soon be awarded for an administration building and two dormitories for the Masonic Orphan's Home at Covina, Cal. The plans are by John F. Blee, of Los Angeles.

Edward T. P. Graham, 20 Beacon Street, Boston, Mass., has prepared plans for a \$100,000 theatre and office building at Cambridge, Mass.

Graham County, Ariz., will build a two-story court house at Safford after plans by Lescher & Kibbey, of Phoenix.

Chelmsford, Mass., will erect a \$60,000 high school building.

The contract for a science building costing \$50,000 for Georgetown University, at Georgetown, Texas, will be ready for letting about April 1.

Fall River, Mass., is planning the erection of a \$150,000 tuberculosis hospital.

Pike County, Mo., will erect a \$100,000 court house at Bowling Green, Mo. Bids will be received about March 17th.

St. Bonaventure College will erect a three-story building costing about \$100,000 at Alleghany, N. Y., after plans by Mowbray & Uffinger, 56 Liberty Street, New York City.

The city of Topeka, Kansas, is discussing the erection of an auditorium to cost \$250,000.

Plans have been drawn for a group of preparatory college buildings at Dunkirk, N. Y.

Cherokee County, Kansas, is planning the erection of a high-school building to cost about \$125,000.

Marcellus, N. Y., will erect a two-story banking building and library. Bids will be received by Harry D. Phoenix, 417 Union Building, Syracuse, N. Y.

Gilbert, Minn., will soon award contracts for the erection of a \$65,000 training school.

North Tarrytown, N. Y., is planning the erection of a Central High School.

Ogdensburg, N. Y., will erect a \$125,000 school building.

The Pilgrim Congregation of Duluth, Minn., will erect a church building at an estimated cost of \$100,000. The plans are by F. G. German & Leif Jenssen, of Duluth, Minn.

Seneca Falls, N. Y., will erect a \$75,000 library building after plans by I. Edgar Hill, of Geneva, N. Y.

Clearwater County, Minn., will erect a courthouse at Bagley, at an estimated cost of \$114,000. Plans are by R. F. Broomhall, of Duluth, Minn.

The contract for the erection of the new Supreme Court and library building at Montpelier, Vt., has been awarded to Geo. T. Kelly, of Yonkers, N. Y., at \$139,488.

The contract for the new court house at Sioux City, Iowa, has been awarded to Splady, Alber & Smith, of Minneapolis, at \$345,308.

Utica, N. Y., is planning the erection of a new city hall.

Vinton, Ia., will erect a \$100,000 high school building.

The Methodist Episcopal Congregation, of Pitman, N. J., is planning the erection of a \$65,000 new church. Plans are by George E. Savage, Philadelphia, Pa.

Proudfoot, Bird & Rawson, of Des Moines, Iowa, are preparing plans for a \$60,000 school at Lewis, Iowa.

Owen McGlynn, of Wilkes-Barre, Pa., is preparing plans for the \$100,000 school building for Carbondale, Pa.

A library, chapel and dormitory will be erected at the Theo-

logical Seminary of the Redemptorist Fathers at Oconomowoc, Wis. The plans are by E. Brielmaier & Sons, 111 Mason Street, Milwaukee, Wis.

Cram & Ferguson, New York and Boston, are preparing plans for the First Presbyterian Church at Edgewood, Pa., to cost about \$80,000.

The Knights of Pythias of Joliet, Ill., expect to erect a \$200,000 lodge, store and office building.

St. Patrick's Congregation, of Malvern, Pa., will erect a stone church and rectory after plans by Paul A. Monaghan, of Philadelphia, Pa.

Grand Rapids, Mich., will erect a union high school, costing about \$190,000, after plans by H. H. Turner, of that city.

Shenandoah, Pa., will erect a \$125,000 school building after plans by Austin L. Reilly, of Wilkes-Barre, Pa.

The Christian Science Congregation, of South Bend, Ind., will erect a \$90,000 church building.

Bell County, Kentucky, will erect a courthouse at Pineville, of native stone, costing about \$100,000.

The German-American Bank and Trust Company, of New Albany, Ind., will erect a six-story bank and office building costing \$250,000, after plans by Joseph & Joseph, of Louisville, Kentucky.

The Security Bank, Savings and Trust Company, of Portsmouth, Ohio, will erect a bank and office building.

The First Presbyterian Congregation, of Wellsville, Ohio, will erect a \$75,000 church building.

A new Y. M. C. A. building, costing about \$200,000, will be erected at Anderson, Ind. The plans are by C. D. McLane, Rock Island, Ill.

Cairo County will erect a courthouse costing about \$200,000 at Delphi, Indiana. The plans are by Elmer E. Dunlap, of Indianapolis, and bids will be received about April 24th.

### New Companies

The Worden-Gilboy Company of Batavia, N. Y., to manufacture granite and marble monuments and stone work of all kinds. Capital, \$30,000. Incorporators, F. E. Worden, F. A. Owen, W. A. Gilboy, Dansville, N. Y.

The Madras Marble Company, of New York, incorporated under the laws of Delaware to quarry and prepare for market marble, etc., for building purposes. Incorporators, J. McLaren, F. B. Knowlton, and E. M. Beyhl, all of New York.

The Melrose Marble Works, of New York, to furnish and set marble and tile and do a general contracting business. Capital, \$1,000. Incorporators, Isodoro Cristaldi, Leonardo Cristaldi, and Andrew B. Florio, Bronx.

The Robert Hunter Granite Company, of Watertown, S. D., and Ortonville, Minn., to manufacture granite. Capital, \$25,000. Incorporators, Robert Hunter and Mary Hunter, Ortonville, Fred Braatz, Watertown.

The Green Stone & Quarry Company, of Sawyer, Wis., to quarry and deal in stone. Capital, \$35,000. Incorporators, Adolph Green, O. A. Green, H. J. Green, G. A. Green and William Green.

The Charles T. Eastburn Stone Quarry Company, of Stockton, N. J., to deal in all kinds of stone and carry on a general contracting business. Incorporators, Charles T. Eastburn of Yardley, Theodore P. Read, of Pennington, and Samuel D. Van Cleve, of Stockton.

The Franklin Soapstone Products Corporation, of Roanoke, Va., to quarry and manufacture soapstone. Capital, \$100,000. Incorporators, F. L. Gitt, president; H. O. Spangler, vice-president; W. W. Lower, secretary and treasurer, all of Roanoke, Va.

The Hoskins-Henderson Granite Company, of Havana, Ill., to manufacture and deal in granite. Capital, \$10,000.

Incorporators, Alexander Henderson, Mary Henderson, Leonie A. Hoskins, W. W. Hoskins.

The Standard Stone Company, of Chicago, to manufacture and deal in stone. Capital, \$5,000. Incorporators, Axel E. Pearson, Isidore Goodman, and Harry O. Rosenberg.

The Breckenridge Crushed Rock Company, of Breckenridge, Caldwell County, Miss., to quarry and deal in stone. Capital, \$25,000. Incorporators, M. H. and A. G. Taubert and C. V. Mayer.

The Neal Gravel Company, of Indianapolis, Ind., to sell gravel. Capital, \$100,000. Directors, B. E. Neal, E. E. Neal and F. M. Neal.

The Howden Tile and Marble Company, of New York, to do a general marble, mosaic and tile business. Capital, \$1,000. Incorporators, Harry Marcus, Frances E. Howden, Bernard Petingor all of Manhattan.

The North Texas Sand and Gravel Company, of Dallas, Texas, to quarry and deal in sand and gravel. Capital, \$4,000. Incorporators, F. A. Jones, J. E. Lewis and J. B. Rucker.

The Tayntor Granite Company, Inc., of New York to manufacture monuments, mausoleums, etc., and deal in marble and granite. Capital, \$10,000. Incorporators, P. A. Koch, L. J. Schindler, W. H. Thomas, 924 E. Thirteenth Street, New York.

The Squaw Island Sand and Gravel Corporation, of Buffalo, New York, to quarry and deal in sand, gravel, etc. Capital, \$250,000. Incorporators, Daniel F. Knowlton, Francis F. Baker, Ralph A. Kellogg, all of Buffalo.

The Grafton Sand and Stone Company, of Grafton, W. Va., to operate sand and stone quarries. Capital, \$10,000. Incorporators, J. A. Sincell, F. C. Graham, Jesse R. Jones, R. M. Parrish and H. R. Wickham, all of Grafton, W. Va.

The Northern Granite and Stone Company, of Cleveland, Ohio, to manufacture and deal in stone. Capital, \$100,000. Incorporators, W. P. Hurst, H. B. Fay, Pearl Keating Hurst and Henry E. Schuer.

The Mount Pleasant Stone Company, of Mount Pleasant, Iowa, to quarry and deal in stone. Capital, \$30,000. Incorporators, Adam Weir, president, Leroy A. Kling, secretary.

The Barre Monument Company, of Chicago, to manufacture and sell marble and granite. Capital, \$2,500. Incorporators, E. A. Twohey, George W. Curtis, and Joseph Orrico.

The American Cut Stone Corporation of Rochester, N. Y., to manufacture and deal in stone. Capital, \$10,000. Incorporators, L. Dargento, E. G. Stillman, J. E. Maher, 301 Seneca Parkway, Rochester, N. Y.

### Obituary Notes

John Quincy Adams Field, for many years one of the foremost citizens of Quincy, Mass., died during the past month after an illness of several weeks. Mr. Field had held many public offices and for a long time was a prominent quarry owner and granite manufacturer. He was a member of the well known firm of Field & Wild and at one time owned a large quarry at Dover, Mass., from which the granite in the court house at Dedham was taken.

Cornelius Linehan, senior partner in the C. & F. C. Linehan Granite Company of Syracuse, N. Y., died during the past month. Mr. Linehan was born in Syracuse and was prominently identified with the monument business of the State. His brother, Daniel J. Linehan, was the president of the State Monument Dealers' Association.

Conrad Fox, a pioneer resident of Racine, Wis., died at

his home in that city during the past month at the age of 84 years. He was a native of Germany but came to this country in 1850. At the time of his death Mr. Fox was the president of the Fox Lime and Stone Company, of Racine, Wis.

William A. Beattie, proprietor of the W. H. Thomas Monument Company, of Schenectady, N. Y., died the past month after a long illness. He was born in Scotland, 49 years ago, and was for a number of years manager of the Ashley Falls Marble Company, at Ashley Falls, Mass.

John S. Collins, one of the pioneer granite manufacturers of Barre, Vt., died in that city the past month at the age of nearly 92 years. Mr. Collins served through the Civil War and entered the granite industry in 1865. He erected what is thought to have been the first stone shed in Barre.

Fred Noble, a well known stone draftsman, died at Bedford the past month aged about 47 years.

### A New York Man Opens a Texas Plant

Sebastian Silvester has opened the Silvester Marble and Slate Works, located in the Chronicle Building at Houston, Texas, and is a contractor and dealer in marble and slate for all purposes. Mr. Silvester was formerly associated with his father in the V. Silvester Marble Works, at Thirty-fifth Street and Tenth Avenue, in this city, for four years as foreman and four years as manager. In his present location, he is in direct line with New York by steamer for raw materials and finished products, and has a plant that will enable him to handle any sized jobs

### Business Embarrassments

Jacob Rushlow, a marble dealer of Rouse's Point, N. Y., has filed a petition in bankruptcy, with liabilities of \$6,077 and assets of \$3,000.

The real estate of the General Construction Company, of Milwaukee, recently declared bankrupt, will be sold by the trustee at 3038 Galena Street, Milwaukee, on March 16.

The Vermont and Chicago Granite Company of Hardwick, Vt., against which an involuntary petition in bankruptcy was filed recently, has given out a schedule of its financial standing. The liabilities are stated as \$30,789.65, including \$21,256.72 in secured claims and \$9,532.69 unsecured. The assets aggregate \$20,837.65 consisting of \$5,000 in real estate, \$1,400 in machinery and \$23,837.65 in book accounts due.

### Trade Notes

The No. 3 Leyner oil burning furnace, which is used extensively for heating drill steel, is now made with a preheating chamber which greatly increases the capacity of the furnace. This preheater is a section which fits between the body and cover of the furnace of the old design. It is, therefore, a simple matter to attach this section to an old furnace by changing a few bolts. Referring to the illustration, it will be seen that the lower chamber is used for the final heating and the upper one for preheating. It is claimed that by the addition of the preheating feature, the space for heating is doubled, the heating capacity of the furnace is increased about 50 per cent. and the efficiency of the furnace is increased correspondingly. The type of burner now furnished with this furnace is suitable for either high or low pressure air. It has merely to be throttled for high pressures and when this is done, it is as efficient as burners designed especially for high pressures and eliminates the noise common to

such burners. This furnace burns petroleum or any of its oils, such as gasoline, kerosene, distillate, etc. Oil heating has many advantages. The steel cannot be injured by absorbing injurious elements such as sulphur, phosphorus or other impurities which are present in nearly all coals, nor from unequal heating as the steel is heated in a flame which imparts a uniform temperature. The steel is in full view of the operator at all times. The floor space occupied by the No. 3 furnace is 3 by 4 feet. No foundation is required, installation being complete when

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air and oil supply pipes are connected. The absence of smoke, soot, dust, ashes and cinders is a great convenience, which is particularly appreciated in underground mine installations and in plants installed in buildings. The manufacturers are the Ingersoll-Rand Company, 11 Broadway, New York.

The Geo. Oldham & Son Company, manufacturers of pneumatic tools and appliances of Frankford, Philadelphia, Pa., announce that they have secured the services of Mr. Arthur B. Brown, of Boston, Mass., who will represent the Oldham Company and devote his entire time to the New England territory. Mr. Brown is well equipped to take care of the trade and will look after their requirements carefully.

Bulletins 154 and 110 have just been issued by the A. S. Cameron Steam Pump Works, 11 Broadway, New York. Catalog 154 is devoted to Cameron Centrifugal Pumps. Sectional views are used to illustrate both the single and double suction Open Impeller Types, and the booklet gives tables of capacities, speeds and horse powers. Catalog 110 covers the Cameron line of Duplex Pumps, including both piston and plunger types, with single and compound steam cylinders for general service, boiler feeding, tank service, water works, hydraulic elevators, automatic pumps and receivers, brewery, quarry and mining work. Catalog is well illustrated and also contains tables of sizes and capacities. Copies of these bulletins free on request to any of the branch offices.



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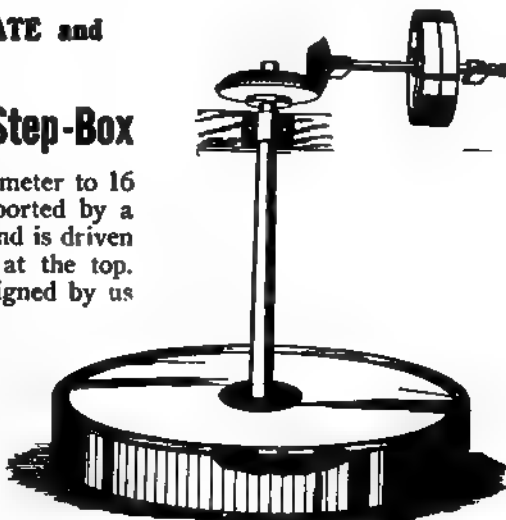
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Width of Blade	Holder	Plain Blades	Coarse Tooth	Fine Tooth
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FRANK W. HOYT, Editor

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APRIL, 1916

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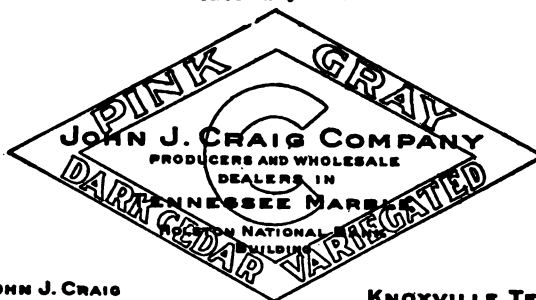
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Specimens shown to the writer from a quarry at Willowton, W. Va., included one of translucent greenish-white color similar to the prevailing color in the Mexican onyx and one of coarse-grained light-brown stone crossed by lines and bands of darker brown. This quarry has been idle for some time, but plans are now under way to renew development work.

There are several deposits in the vicinity of Cave City, Glasgow Junction and Mammoth Cave, Ky., some of which have yielded small quantities of material for a number of years. These deposits are mostly in caves. Of the few visited by the writer in June, 1915, some are too small to be of much commercial promise; others are of sufficient size, provided material of attractive appearance can be obtained. The material seen in place is coarse-grained and varies in color from white through shades of yellow to brown with typical parallel and concentric banding. Material of reddish color also is said to have been found.

"Onyx marble" has been produced from time to time near Rio Puerco station, in Valencia County, N. Mex. The stone, according to Merrill, varies from whitish to deep smoky, almost black, and from translucent to

opaque, and the better varieties show on a polished surface a silky luster and a radiating fibrous structure. It is distinctly banded, the bands varying from faintly whitish to nearly black. The material, though lacking in richness of color, is, owing to its luster and fibrous structure, very attractive.

One of the most extensive deposits in the country, so far as the writer knows, is a group of veins in Tooele County, Utah, near Low station, on the Western Pacific Railway. The veins range up to 200 feet and more in width and consist of parallel bands of fine-grained, light-colored stone. The colors of different layers include white, cream, yellow, orange and pink, with more or less distinct parallel and concentric banding. Blocks of sufficient size for all general purposes can be obtained. In September, 1914, when the locality was visited by the writer only one of the smaller veins had been worked. The stone from this vein was used in the new State capitol in Salt Lake City, Utah.

The most promising deposits in Arizona are near Mayer, about 26 miles southeast of Prescott; at Cave Creek, about 45 miles northeast of Phoenix; and in Santa Cruz County, about 4½ miles south of Greaterville, Pima County. The deposit near Mayer is reported to cover about 200 acres and to vary from 1 to 25 feet in thickness. Small portions of it are of a quality suitable for decorative purposes. The stone is for the most part white or pale-green, with stains of brown and deep-red. The deposit at Cave Creek is of similarly colored stone, but the extraction of large blocks is said to be difficult. The deposit in Santa Cruz County is found in a limestone cave. The stone is said to possess considerable homogeneity of texture and of color, the latter including various shades of brown and to be so free from fractures that the size of blocks obtainable is limited only by the capacity of the equipment that may be installed and by transportation facilities.

Several deposits have been worked or prospected in California, but most of them are of too slight extent to be profitably worked. The most important deposit is at Musick, in San Luis Obispo County. It forms layers from 1 to 30 inches thick, but mostly less than 10 inches. It is a translucent stone,

partly banded and variegated, partly white and massive, and it takes a brilliant polish. Blocks from 3 to 6 feet square have been quarried and larger ones are said to be obtainable.

Mr. Loughlin also discusses the lithographic stone deposits of this country. He declares that the importations of this stone varied from \$146,114 in 1903 to \$46,043 in 1914, the largest amount during that period being in 1906, when the importations were valued at \$158,631. Then he adds:

These figures represent the value of the stone at the point of shipment and do not include ocean freight or other charges. The cost to the consumer in the United States is probably more than double the value given in the table. The figures, although fluctuating, show a general decrease in value, with the lowest amount, \$46,043, recorded in 1914. This sum, however, represents only half a year of imports, as the principal source of import in the second half of 1914 was cut off by the European war. The total value of \$70,984 for 1913 represents the minimum value recorded under ordinary conditions. From the fact that there has been almost no domestic production of lithographic stone during these years, it is concluded that the decrease in imports has been caused either by a decrease in supply of the stone or by the use of other materials, such as zinc and aluminum plates and rolls, instead of stone.

Over 90 per cent. of the imports came from Germany and about 7 per cent. from Belgium. Small quantities were also imported from Canada and from the Netherlands.

During 1913 and 1914 small quantities of lithographic stone were quarried and sold by the German Lithographic Stone Company, whose quarry was at Brandenburg, Meade County, Ky. This company was operating as early as 1900, and was intermittently active until March 1, 1915, when its holdings were taken over by the Kentucky Lithograph Stone Company, of Louisville, Ky. This company, when visited by the writer in June, 1915, was installing new equipment, and had one planer in operation. A large number of sawn and trimmed stones varying from less than a foot square to 42 by 62 inches in area were in the storeroom. These stones had been taken from a nearly horizontal bed which was 34 inches thick, where measured. Three other beds, possibly suitable for lithographic stone, were seen at intervals below the bed first mentioned. These ranged from 4 to 10 feet in thickness. Only portions of them considerably affected by the weather were exposed in openings along a cliff, but core drill samples of them, taken well back from the cliff exposures, were said to be of good quality.

At Lithograph City, Iowa, a deposit including beds with the characteristics of lithographic stone, and of marble has been controlled by the Interstate Investment and Development Company for several years. No production of either kind of stone, however, has thus far been reported to the Survey. The most prom-

ising bed of lithographic stone seen by the writer in July, 1915, measured, where exposed in a vertical cut, 22 inches in thickness. This exposure shows that blocks 6 feet long can be obtained, but gives no indication of their width. Loose blocks were seen in the ground near by large enough to yield trimmed stones 2 by 3 feet and possibly 2 by 4 feet in area. Prints shown the writer and said to have been made from samples of this stone, would indicate that these samples were of good quality. Other samples of lithographic stone from this vicinity and from the same formation have been submitted to the Survey for testing by different parties, and the tests have yielded varying results.

Small samples from a deposit of lithographic stone near Custer, S. Dak., have recently been tested by the Survey and include material both of very good and of fair quality. This deposit is owned by John F. Sidey, of Custer.

Prospects of lithographic stone have also been reported at different times from Alabama, Arizona, California, Colorado, Georgia, Illinois, Missouri, Nevada, Tennessee, Texas and Utah, but for one reason or another they have not been developed.

The foregoing paragraphs show that there are in the United States deposits of lithographic stone that have been proved to be of good quality, and it is reasonable to expect that the country's demand can finally be supplied from them. According to the table of imports, however, the demand is less than it was and is not such as to encourage extensive operations.

### Utah Marble Deposits

The Wasatch Marble Company, of Salt Lake City, Utah, has taken over all of the properties of the Utah Marble and Construction Company, and now controls 100 acres of marble deposits in Beaver County, and 3,000 acres of marble and onyx deposits in Utah County, including a deposit of birdseye marble in Hobble Creek. The white marble was suggested for the Utah state capitol, but it was finally decided to erect that building in the Little Cottonwood granite. It is expected that when the weather becomes settled, a fine black marble deposit in Utah County will be opened up. C. L. Goff is president of the company and A. F. Judd, secretary and treasurer.

### A Monument for the Unknown Dead

The General Herkimer Chapter of the Daughters of the Revolution, of Herkimer, New York, will erect a monument to the unknown dead near that place. It is intended to mark the graves of Major Woodbury and 27 of his men who were scalped during the Revolutionary War, when they sallied out from Old Fort Dayton, now the site of the court house in Herkimer. The monument will be erected on a big mound which rises above the surrounding country.

## Properties of Building Stones

**I**T is a peculiar fact, often pointed out in these columns, that architects, who make a wider use of stone in their daily practice than the members of any other profession, should have such a limited technical knowledge of the characteristics and physical properties of building stones. Their choice of any particular variety of stone is generally based upon the question of cheapness, availability, color or texture. Of course these are very important considerations, but they should not entirely outweigh the matter of durability and fitness. Under the latter term may be classed the suitability of the stone, by reason of its strength, chemical composition, porosity, and weathering qualities, for certain uses and surroundings. A stone that may be altogether admirable in certain employment, may fail to give satisfaction if the atmosphere is impregnated with sulphurous gases, or if impurities can be absorbed from the soil or from vegetation, as may be the case in cemetery work. If the architect is to settle such questions to the satisfaction of himself and his client he must have rather an exact knowledge of the economic geology of building stones. The importance of such a study is constantly receiving more attention in the architectural schools.

Prof. Heinrich Ries delivers each year a course of lectures to students in the College of Architecture of Cornell University on Building Stones and Clay Products, and the favorable reception which these have received has led the author to arrange them for publication in a volume with the foregoing title. This is intended as a Handbook for Architects. Prof. Reis has made no attempt to prepare a treatise on scientific geology, but has aimed simply to give the fundamentally important facts bearing on the adaptability of stone for architectural uses. To the

architect, as to the practical quarryman, there is only academic interest in the geological age of any particular stone, or even as to whether it is an igneous, a metamorphic or a sedimentary rock. On

the other hand, it may be a very vital matter to know the exact nature of the mineral elements that enter into its composition. Quartz is one of the commonest and most important ingredients of most stones, and yet how few there are who understand the effect of its presence. So it is with the feldspars and the micas, and even with calcite. The chemical analyses of stones is frequently asked and given, but what do they amount to? Extremely few of those who use stones are able to draw any practical conclusions from the relative proportion of silica and alumina, calcite and magnesia. There is a general impression that iron is a source of weakness in any stone, but few take into account the form in which this element makes its appearance.

The chapter by Prof. Ries on "Properties of Building Stones" is of prime importance to all architects. With regard to texture, Prof. Ries says that fine-grained rocks whose grains are closely fitting are denser and may also be more durable. This is espe-

RESIDENCE OF F. J. WECKESSEK AT WILKES-BARRE, PA.

Architect, C. P. H. Gilbert, 1123 Broadway, New York. General Contractors, Shepard Construction Company, Wilkes-Barre, Pa. Cut by the Hoosier Cut Stone Company, of Bedford, Ind., in dark blue Indiana limestone from the quarries of the George Doyle Company

cially true in granites, the finer-textured ones being of longer life than the coarse-grained and the porphyritic ones. If the mineral particles are not only large but of unequal hardness, the softer ones disin-

tegrate more readily, thus leaving small pits on the surface. Cleavage cracks may also open up more easily in the large than in the small mineral grains.

The hardness of a rock and the hardness of its component minerals should not be confused. The former depends on several factors, such as hardness of component minerals and relative abundance and state of aggregation. A rock may therefore consist entirely of hard quartz grains and yet be bound together by so little cement that it will crumble under very little pressure. Another one similarly composed of quartz grains may be so well cemented by silica as to show a high crushing strength. Hawes has shown that the hardness of certain granites, for example, is not due entirely to quartz, which is hard and brittle and crushes under the tools, but that it is due to the feldspar, which is of variable hardness and has different cleavages.

Although hardness is an important quality there is no standard method of testing it, but the following ones are sometimes used. Rosiwal, adopting Toulal's principle, uses a piece of smooth but unpolished granite of about 2 grams' weight and rubs it with emery (of 0.2 mm. diameter grain) upon a glass or metal plate for from 6 to 8 minutes until the emery loses its effectiveness. The granite is then weighed and its loss of volume calculated. Such a test is rather inaccurate. A test suggested by J. F. Williams consisted in noting the rate of penetration of a drill of a given diameter, or by measuring the distance to which such a drill will penetrate without being sharpened; or it might be possible to determine the amount of rough-pointed surface that could be reduced to bush-hammered surface in an hour. To make this last test of value a pneumatic drill or surfacer should be used.

The colors of building stones, says Prof. Ries, are in many cases really of a composite character, being produced by a blending of the colors of the individual minerals. Uniformity of color may be produced by uniformity of distribution of the mineral grains or by the rock being composed entirely of one mineral. After discussing the variations in color of the different stones, Prof. Ries says that changes of color may occur after the stone has been quarried. In stones colored black or gray by carbonaceous matter a slight fading is sometimes noticeable. Some bright pink granites have also been known to fade on continued exposure to the sunlight. Certain sandstone, though white or light gray when freshly quarried, may, on exposure, change to buff or brown, owing to changes within the rock. These changes do not necessarily represent a weakening of the stone.

It is contended by some, says the author, that it is of more importance to determine the porosity than the absorption since the latter does not show the amount of water the stone is capable of holding and because there is no fixed ratio between pore space and absorption; moreover that the porosity together with the size

of the pores gives us a better index of the frost-resisting qualities. Stones of high porosity, but small pores are presumably less resistant to frost than those of high porosity and large pores. It must be admitted, however, that in general stone of high porosity shows high absorption, and that the determination of the latter gives us a rough index of the porosity.

By the term absorption is meant the amount of water which a stone will absorb when immersed in this liquid, and it should not be confused with porosity or the volume of pore space. While stones with low porosity can absorb little water, nevertheless the absorption does not necessarily stand in any direct relation to the volume of pore space. A high absorption is considered undesirable, as the freezing of the water in the pores of the stone may cause it to disintegrate, but this injury is often more pronounced in the fine-grained than in coarse-grained materials, for the reason that in the former the water can drain off less readily. Dense rocks, like granites, gneisses, slates, marbles, many limestones and quartzites, usually show a very low absorption, often under 1 per cent. Other rocks, including many sandstones, some limestones, especially soft ones) and volcanic rocks like tuffs, may absorb from perhaps 2 up to 15 per cent. of water.

Prof. Ries follows the same argument that we have often advanced in these columns when he declares that crushing strength is a property to which undue importance has probably been attached; indeed in some cases it may be the only test that is made on a stone. It can be safely assumed, as one writer has said, that a stone which "is so weak as to be likely to crush in the walls of a building, or even in a window stool, cap or pillar, bears such visible marks of its unfitness as to deceive no one with more than an extremely rudimentary knowledge on the subject." Few stones will, when tested, show a strength of under 6,000 pounds per square inch, and many, especially igneous ones, stand as high as 20,000 to 30,000 pounds per square inch. To be sure, in some large buildings a single column or block may be called upon to carry a heavy load, but even then it probably does not approach the limit of strength of the stone. Merrill has shown that the stone as the base of the Washington monument supports a maximum pressure of 22,658 tons per square foot, or 314.6 pounds per square inch. Allowing a factor of safety of twenty would only require the stone at the base of the monument to sustain 6,292 pounds per square inch. Even at the base of the tallest buildings the pressure is probably not more than 160 pounds per square inch.

### The Earth's Age as Shown by the Rocks

Scientists differ greatly as to the earth's age, estimates varying from 20,000,000 to 150,000,000 years. One of the first estimates was that of John Phillips, who in 1860 based on a study of stratified rock his assertion that the figure lay somewhere between 38,000,000 and 96,000,000 years.

## The Minnesota Granite District



THE granite industry in Minnesota is centered in what is called the St. Cloud district, although the operations are conducted in Stearns, Benton and Sherburne counties. The first quarries were opened nearly fifty years ago, but the industry did not assume any importance until recent years. There are now 26 operating firms, with \$1,745,000 invested in their plants, and about 2,500 men are employed. The local newspapers are tireless in booming the industry, and they are inclined to make rather more claims than can be justified by the figures of production. One of them prints an interesting sketch of the work in this field that is important as a contribution towards the history of a great industry.

St. Cloud today has the state reformatory located in Sherburne County—St. Cloud is in three counties—and it was where the reformatory is now that the first granite quarry of the St. Cloud district was opened. This was in the spring of 1868, and the first order was for dressed stone to be used in the corners, steps and trimmings of the United States Customs House and post office in St. Paul. At the same time the company received orders from Rock Island for stone. Granite from this quarry was used for the basement of the original Normal school building at St. Cloud.

Today this original quarry belongs to the State of Minnesota and does not compete with the private quarries of the St. Cloud district. This quarry and the others which surround it now are worked by the prisoners in the state reformatory, but the stone is used in the reformatory buildings.

Quarries were opened in the late '60s near Sauk Rapids and Watab in Benton County. Much of the stone cut in these quarries was used in railroad bridges. In 1869 and 1870 about 3,200 tons of stone was shipped from St. Cloud to St. Paul.

It was in 1876 that the St. Cloud district got its first big order for residential building purposes. Alexander Mitchell, a Milwaukee millionaire, had his house built of granite and placed his order with the company which had been the pioneer in quarrying. Three years later from the same quarry were taken four of the largest granite blocks ever taken from a western quarry up to that time. Each block contained 75 cubic feet and weighed 12,000 pounds. They were shipped to Milwaukee to be used as piers in the "Mitchell Exchange."

Prior to 1875 the quarry development of the St. Cloud district was limited to the east side of the river. In 1875 the first company was organized to quarry

### AN ATTRACTIVE STONE EXHIBIT

The showing made by the Ohio Quarries Company at the Complete Building Show held in Cleveland in February. Stone was exhibited in various styles of finish, and a workman was engaged turning stone balusters

on the west side. The quarry was three miles west of St. Cloud and the stone was red. This quarry has furnished the stone for some of the finest buildings in the twin cities. The New York Life Building in Minneapolis and the New York and Germania Life Building in St. Paul are built of this material.

Then, in the '80s, came the foundations for the business as it is today. About eight new companies were organized and quarry properties were opened northeast and west of St. Cloud. St. Cloud granite began to be known among the builders of the northwest. Granite was furnished the railroads for bridge piers, granite was shipped for buildings, granite was shipped to be used in the old government building in Minneapolis.

Steam polishing plants began to make their appearance in the St. Cloud district, and in 1886 37 polished columns of granite were shipped to Lincoln, Neb., and used in the construction of the Nebraska state house. About the same time a platform of granite with an unbroken surface of 15 feet 6 inches by 10 feet was shipped to Minneapolis for use in the public library building. This last shipment marked something of an epoch in the history of the granite industry in St. Cloud. It was one of the largest granite surfaces quarried in the west up to that date.

Prior to 1886 most of the stone from the St. Cloud quarries had been used for building and ornamental work, but in the late '80s the shipments of granite paving blocks began. These shipments have continued ever since. In 1886 the shipment of granite from the St. Cloud station was 886 cars, in 1887, 1,842 cars, and in 1888, 1,927 cars.

Although the early companies prospered, it was not until 1896 that the granite industry in St. Cloud became well established. The immense amount of labor involved in quarrying had held back development. Stone was plentiful but labor and capital were not. Then, about 1895, the possibilities of the granites of St. Cloud for monumental purposes were realized. Plants with fully equipped cutting sheds began to spring up.

In the St. Cloud district today are 26 firms. Most of them are working quarries of their own. Most of them have polishing plants. Many of them have departments devoted solely to monumental work. All of them are working at full capacity. One company employs from 150 to 200 men and has a paid up capital of \$400,000. Quarries are operated by electricity. The larger companies own their own locomotives. Steel saws are being introduced and granite is being sawed like wood, but with more strain on the saws.

### Tariff Hits the Granite Industry

"The granite industry in my state, which represents thousands of dollars in investments and which furnishes employment to a vast number of men, is feeling the effects of the Underwood tariff, which reduced the duty on granite from 50 to 80 per cent. ad valorem and from 10 to 3 cents per cubic foot," said Congressman

Edward H. Wason, of the second New Hampshire district, to a newspaper reporter. "In my district there are extensive granite quarries. Not only the owners, but the employees, are getting thoroughly alarmed over the present outlook of the business. Both Norway and Sweden produce great quantities of granite. On account of the war in Europe there is no market there for this product, and with the decrease in the duty and the lower wages paid across the water, this granite is being shipped here and sold at such a low price that the American producer cannot compete with it in the open market. It bids fair to close many quarries and curtail and cripple the output of New Hampshire concerns, which means the throwing of thousands of men out of employment. When this schedule was before the Senate, Senator Gallinger made a strong plea for the retention of the Payne duties, but his colleague, Senator Hollis, stated that the change would not affect the industry, and then voted with his party for this sweeping reduction of duty. As a result the granite industry of our state has been hard hit, so much so that earnest and appealing protests are coming from both owners and operators of the granite quarries urging Congress to revise the schedule and give them the protection necessary to keep the New Hampshire quarries running."

### A New Marble Industry at Dorset

It is reported that Hugh Duffy and John McTierney, of Rutland, and H. B. Kendall, of Dorset, Vt., have purchased 300 acres of land, situated between East and North Dorset, and said to contain marble deposits. These men purchased about 200 acres of the land from Edwin Shuttleworth, of New York, the owner of the famous John K. Friedley properties in Dorset. The three new owners of the land are not new in the marble business. Mr. Kendall has been associated with it since boyhood, and Mr. McTierney was for a quarter of a century in the employ of the Brandon-Italian Marble Company at Middlebury. Mr. Duffy was in the employ of the Columbian Marble Company. He is at present a leading coal merchant of Rutland.

### Stones to Repair Washington's Home

Mention has been made of the long continued efforts of the regents in charge of Washington's home at Mt. Vernon to get English stones to replace the much worn flooring of the portico. These efforts have finally been crowned with success, and the stones are now at a wharf in Yorkshire, awaiting shipment to this country. The stones have been taken from the old Bees' Head Quarry of Cumberland, England, where George Washington procured the first stones nearly 200 years ago. They are believed to be exact duplicates of the originals. The quarry is nearly 300 years old. It is located near White Haven, where Washington's grandmother is buried.

### A New Marble Quarry in Alabama

The Madras Marble Company, of 120 Broadway, New York, recently incorporated with a capital stock of \$1,000,000, has taken over the holdings of the Marble City Quarries Company, near Sylacauga, in Talledega County, Alabama. The new company now holds in fee 91 acres, all of which is underlain with a deposit of ivory white marble. The engineering firm of Rickards & Banks has core-drilled the property and reports that on only 4.33 of the 91 acres they have proved up more than 10,000,000 cubic feet of marble. The deposit directly adjoins that of the Moretti-Harrah Company, from whose quarry was taken the marble used in the interior finish of the Western Union Building in New York. A branch of the Louisville & Nashville Railroad crosses the property and a line of the Central Railroad of Georgia is within two miles. The company has made a contract with a New York dealer for handling the entire output of the quarry. The stone is very fine-grained of a cream white and takes a high polish. It is translucent and the cores seem to show that a good proportion of the marble is of statuary grade. Several large slabs have been elaborately carved, the marble being sound and strong enough to show the finest details. In addition to the statuary white, there is veined and mottled marble suitable for interior decoration. It is expected that the quarries will be opened and operated to capacity at once.

### The Use of Granite in Norway

The granite quarries in the Bergen consular district are small, only about sixty men being employed throughout the district, writes Consul Charles Forman. The granite is suitable only for building stone and for monuments. Its use for building purposes is increasing, and will no doubt be in still greater demand when the rebuilding takes place of the greater part of the business district that was destroyed in the great fire of January 15, 1916.

The granite produced in the Bergen consular district is unsuitable for paving stone, as it is too hard and costly for that purpose. The paving stone used in the cities of Norway is obtained from the eastern part of the Kingdom, the most important granite quarries being situated in the consular district of Christiania.

The wages received in the granite industry are as follows, per day: Laborers, 80 to 94 cents; quarrymen, 94 cents to \$1.07; cutters handling monumental stone, \$1.47 to \$1.61; and cutters handling building stone, \$1.61.





### Utilization of Marble Waste

The Phenix Marble Co., of Kansas City, Mo., has recently made a contract with George T. Cook, a railroad supply contractor of that city, for the purchase of all its waste product, being the accumulation of 26 years' operation. Mr. Cook has erected at Phenix a large crusher plant where this waste product is being

used for railroad ballast and other crushed stone commodities, including fertilizer. Quarrymen would do well to study an outlet for their waste products, which could often be turned from a source of expense to a distinct profit. With the many demands made for and the diversified uses of crushed and ground limestone, there should be an outlet in many districts for these waste products.

### Bill of Quantities for Stone

The movement in favor of the adoption of the Quantity Survey in this country is making sure and steady progress. Nearly every argument that can be advanced is in favor of such a system. Under our present methods, each contractor takes off the quantities on all proposed work for himself. This not only entails an expensive estimating force, but it also tends toward errors in the quantities upon which bids are based. As a usual thing, there is very little time between the com-

Description	No. of Pcs.	Length	Depth	Height	Unit Cube	Total Cube	Rate	Amount
					Brought Forward			
NORTH WING:								
NOTE: All face-work six out, fresh-faced, machine dressed.								
Plain ashlar 8" and 12" beds:	2	110-0	0-10	2-0	---	183-4		
Plain quoins:		1-6	1-0	2-0	3-0	6-0		
 Moulded water table:		108-6	0-8	1-4	---	96-5		
External return of last:	2	2-3	1-4	1-4	4-0	8-0		
Plain ashlar band:		110-0	0-4	1-8	---	61-1		
Plain quoins:	2	1-6	1-0	1-8	2-6	5-0		
 Window sill with wash & lugs:	10	7-0	0-8	1-3	5-10	50-4		
Plain window jamb:	40	2-0	0-8	1-3	1-8	66-8		
	60	1-5	1-0	1-3	1-7	83-9		
Plain head sunk at back:	10	7-0	0-8	1-5	6-7	66-1		
 Moulded string course:		110-0	0-7	1-2	---	74-10		
External angle stone of last:	2	1-6	0-11	1-2	1-7	3-3		
 Moulded base to parapet:		110-0	1-2	1-3	---	160-6		
External angle to last:		1-6	1-6	1-3	2-10	5-6		
Carried Forward								
Quantitytown Municipal Building. Sheet 11 of 77								
Cut Stone. Granite. 3 February 1916.								

### SAMPLE BILL OF QUANTITIES

pletion of plans and specification and the date set for the receipt of bids. If twenty or thirty estimators, representing all of the different lines of trade, have to take off the quantities, it is certain that some of them will be so hurried that they cannot make an accurate job. Bids that are based upon an inaccurate bill of quantities are unfair not only to the contractor who has cheated himself with regard to the quantities, but also to the more careful contractor, whose figures are exact.

For many years the Quantity Survey system has



been universal in Great Britain and it has given universal satisfaction. The only thing that seems to stand in the way of its adoption in this country is the question of payment. In England, the quantity surveyor is paid by the owner of the building, the fee averaging perhaps 2% or less of the total cost. It is thought that the building owner in this country would not stand for the imposition of a definite percentage for the taking off of a bill of quantities. Doubtless, this is true, unless the owner can be brought to see that he must eventually pay this no matter how or where the sum is included. It stands to reason that it is more economical for one set of men to take off the quantities than for a dozen or twenty to duplicate the same work. It is stated that under our present system nearly 3% of building costs represents the estimating expense that contracts carry. Of course, it is proper that the owner should pay the cost of taking off quantities the same as he pays the commission of the architect. If the system were universally adopted, it would not be difficult to prove the economy of this method, but until the move-

ment has made more progress, it is suggested that payment be made in the following manner: The architect decides how many general contractors may bid and the cost of the bill of quantities is divided by this number. Each general contractor would be charged that amount for a complete Quantity Survey of all trades. He in turn can collect from his sub-contractors the proper amounts for bills of quantity in their trades. In this way, each contractor will receive accurate itemized quantities at a fraction of the expense to which he would be put to take off quantities himself. The architect has only to instruct his contractors that he will guarantee uniform quantities as a basis for bids.

We are reproducing herewith a sample sheet of quantities for stone work, ready for pricing. It will be conceded that this is more accurate and scientific than the usual list of quantities on which stone bids are based. If any cut stone contractor has any criticism to make of this schedule or if any contractor can suggest improvements in taking off the quantities, we shall be very glad to present the matter to our readers.

## Electricity in a Stone Plant

By JOHN A. RANDOLPH



STONE cutting is one of the oldest of arts. It dates back even to pre-historic times when primitive man was wont to fashion from stone crude hatchets and utensils. The work was slow and tedious. It required patience of the most enduring type. There was little time in those days for decoration and luxury. But man is a progressive being. He builds upon evolution and thus does he develop. As a result of this instinct, early man gradually improved his methods of stone working until he was able skillfully to fashion huge marble pillars and to build beautiful structures. It remained for modern times to advance the art to the stage where it is possible to perform practically every phase of stone cutting by machinery, thereby saving time, labor and expense. Many of the thoroughly up-to-date plants do not even use engines for driving their machinery, but employ the more modern and efficient form of power, electricity instead.

A notable example of an electrically-driven plant is comprised in the large stone cutting works of David G. Morrison located in Long Island City, N. Y., on the bank of the East River near the great Queensborough Bridge. Every operation at this plant is performed by electricity. It carries the heavy blocks of marble and other varieties of stone about the building and places them in position on the cutting machines. It saws the blocks into slabs, polishes the surfaces, carves out the ornamentations and pumps the large quantities of water used. There is little left for human hands to do except to operate the machinery. The plant has

been in operation for 30 years. Steam was originally used for power, but in 1909 was supplanted by electricity. The latter form of power has proved more economical, reliable and convenient.

The rough materials are brought to the plant by boat. As received, they are in the form of huge blocks weighing many tons each. For handling the blocks inside the building, two electric cranes are provided. One of these is of 20 tons capacity and is equipped with a 5-ton auxiliary hook. Three motors are used for the various movements in connection with the main operations and one for supplying power to the auxiliary hook. The other crane is of 5 tons capacity and is driven by three motors. The movements of both cranes are controlled from cabs from which the operators can obtain a clear view of the floor.

For slab cutting 8 horizontal gang saws are used. Each machine is driven by a 50 horsepower motor. The large quantity of water necessary for the operation of the saws is supplied by two motor-driven rotary pumps. Under the powerful action of the saws, huge blocks of marble in a remarkably short time are cut into slabs with as much precision and with almost as little difficulty as though they were merely blocks of wood. The operation is very similar to the working of the vertical gang saws in lumber mills, employed in the cutting of planks and boards from logs. The use of individual drive makes each saw independent of the others in actions. It can be started and stopped at will without the use of clutches or idler pulleys.

For sawing purposes where it is desired to make but

one cut at a time, a straight horizontal single-blade saw is used. The blade has 22 teeth and each tooth contains 6 diamonds. To the layman the use of diamonds in this connection is highly interesting. These stones are placed in the teeth according to a definite arrangement and by a special process. Their use is highly effective in preserving the teeth. The superior hardness of the diamonds enables them to endure the abrasive action of the sawing much longer than could steel. The saw is driven by a 12½ h.p. motor. Diamonds are also used in the teeth of a large circular saw comprising another unit of the mechanical equipment. This saw is designed to move backwards and forwards horizontally. The saw proper is connected through a flexible chain to a 15 h.p. motor. The saw and carriage are moved horizontally by a 5 h.p. motor. The saw operates at 600 R.P.M.

For polishing the surfaces of the cut stones, a rotary rubbing bed operating at a speed of 40 R.P.M. is provided. It comprises part of a group, the other machines of which consist of two gang saws and a punch. These machines are belted to a common shaft which is driven by a 35 h.p. motor. Another group operated from a single motor is composed of one small and 2 large planers, 3 double emery grinders, one air compressor and a pump for the water system. These machines are all driven by a 35 h.p. motor. The compressor operates 10 air hammers which are used for carving figures and ornamentations upon marble used for decorative work. The powerful strokes of the hammers upon the finely ground carving tools enables a skilful operator to make rapid progress on his work. This method effects a great saving of time over the obsolete hand method.

The water pump operates by the air compression method. It forces water from a deep well to two tanks located on the roof, the total lift being 200 feet. The capacities of the tanks are 3,000 and 10,000 gallons respectively.

The electric power used at the plant is purchased from the New York and Queens Electric Light and Power Company. The current is 2-phase alternating and is carried to the plant at a voltage of 2,200. It is there stepped down by transformers to 220 volts for use on all the motors except those on the cranes. The latter operate on direct current at a voltage of 300. To provide the special service for the cranes, a direct-current generator driven through shaft connection by a 50 h.p. A. C. motor has been installed. The extensive use of individual drive enables a wide range of flexibility in the operation of the machinery. It also eliminates the large amount of belting, pulleys and shafting that would otherwise be necessary.

### A Mammoth Department Store for Canada

Plans and specifications have been prepared by Graham, Burnham & Co., architects of Chicago, for an elaborate group of buildings for the T. Eaton Co.,

Ltd., of Winnipeg. The scheme will comprise a series of connecting structures, 12 stories in height, replacing the present nine-story building. When completed, the premises will cover an additional city block. Two bridges, thirty-eight feet from the ground and nine stories high, and sundry tunnels under streets will connect the buildings. The buildings will be of Tyndall stone from the ground to the top of the second story. The work will be done in units, the entire scheme to be completed in eight or ten years. The probable cost will be eight million to ten million dollars.

### Talc Deposits in Ontario

There are located in the Kingston consular district two talc deposits, one at Madoc and the other at Eldorado, and the greater part of their output is milled locally writes Consul Felix S. S. Johnson, from Kingston. Both mines and mills were in active operation at the end of 1915, showing a record output of over 12,000 tons. The deposits are said to contain plenty of talc. That at Madoc occurs in a series of overlapping more or less upright lenses, the greatest width of the talc body being about 60 feet. A depth of 250 feet has been reached in the workings. Most of the output is sent to the mill at Madoc, and a small quantity of the crude is shipped to the United States. The talc at Eldorado contains rather a large admixture of quartz, which occurs throughout the talc body in small lenses and has to be cobbled out. The value of talc exported to the United States from this consular district in 1915 was \$60,843.

### Personal

A. G. Zimmermann, architect, announces the removal of his offices from 11 East 24th Street, New York, to 1051 Otis Building, 10 South La Salle Street, Chicago, Ill.

E. P. Worden, formerly of Fred M. Prescott Steam Pump Works, Milwaukee, has been appointed chief engineer of Henry R. Worthington, Harrison, N. J.

P. P. Bourne, formerly chief engineer of Blake & Knowles Steam Pump Works, East Cambridge, Mass., is again associated with the International Steam Pump Co., in connection with special engineering work at the company's main office, 115 Broadway, New York.

### A New Post Office for The Bronx

Representative Bruckner has introduced a bill in Congress appropriating \$1,000,000 for the erection of a new post-office building for the borough of the Bronx, New York, to be located at 149th Street and Mott Avenue. A delegation from the Bronx Board of Trade appeared before the house committee on public buildings and grounds to urge the necessity of suitable postal accommodations from this great and growing district. The committee pledged itself to favorable action on the bill.

### Placing the Blame for Poor Concrete

We hear a great deal about poor concrete construction due to incompetent handling. Just as frequently we hear the architect criticized for awarding a contract to an irresponsible cement man. Now, as a matter of fact, the real culprits, if culprits they may be, are neither the architect nor the engineer, but most frequently the corporation that sells the material, knowing, at the time, that it is bargaining with a weakling, says a writer in the *Architect and Engineer*, of San Francisco. If the manufacturer should decline to sell his product to his fellow unless he submitted satisfactory proof of his good standing financially and professionally, there would be very small chance for a failure. It would be up to the architect or owner to reward the contract to a responsible bidder. The trouble heretofore has been that the manufacturers—both of cement and the machinery with which it is mixed—in their mad rush to corral the business, have been encouraging everyone who desired to go into business for himself to enter the concrete game. The general public seems to be firmly convinced that anyone who can drive a nail through a board can build a concrete form, and that anyone who can turn a shovelfull of grout can make concrete. To illustrate:

Comes now John Smith, out of a job, or looking for new fields. He sees an advertisement for a block-machine, we'll say, which looks attractive. His order is promptly mailed and the machine received. He borrows his neighbor's vacant barn for use as a shop, buys three or four sacks of cement from the lumber yard and has a load of sand sent up. Within a day he is making concrete blocks and has some letterheads struck off, giving his name as "general concrete contractor"—that always "listens" good. Meanwhile, Brown, the other concrete man in town, is figuring with Jones on the erection of a concrete block house; Smith hears of the job and goes after it. Naturally, he has no reputation to help him land the work (and none to sustain, either), so he plans his advantage from the low-cost standpoint; he bids two or three cents lower per block in order to get the first job and "show what he can do." Within a short time he is known as "Cheap John," is kept busy repairing his jobs, replacing poor material, and dodging his creditors. Finally his shop is closed, or Brown, whose business he has greatly injured, magnanimously buys him out.

This is not imaginary. Pity is, it's true. Not one concern alone is to blame, nor one man. In a certain concrete journal, September issue, there appeared a long article, illustrated, showing \$20,000 worth of concrete culverts and bridges in the state of Iowa, which will have to be entirely rebuilt by their erectors because it wasn't "concrete for permanence."

We know of a certain county in Illinois where bids were recently opened for construction of a 12-foot-span bridge. The engineer's estimate was \$1,140. Bidders

were eleven in number. Bids ranged from a maximum of \$1,350 down to \$350. No amount of clean, square get-to-gether could have changed that situation. The plain fact is that at least half the men bidding knew absolutely nothing about their own business.

### Marble Deposits in British Columbia

Among the many natural resources of British Columbia available for commercial and industrial purposes is a fine grade of marble, writes Consul General R. E. Mansfield from Vancouver. An extensive ledge of what is designated as Malaspina marble is now being worked on Texada Island, about 50 miles northwest of Vancouver. It is a Crinodial formation, its most attractive feature being the variety and extent of tints and coloring shown in irregular streaks.

Marble from the Texada Island quarries was used for decorative purposes in the new Vancouver Hotel, completed in 1915, and samples exhibited at the Panama-Pacific Exposition at San Francisco attracted favorable attention. The deposits are found on the southern end of the island adjacent to a land-locked bay, which facilitates the transportation of the product to markets on the mainland.

The value of marble imported into Canada in recent years has averaged about \$500,000 a year. In addition to the imported article, that from Canadian quarries, particularly the green marble of Missisquoi, are extensively used throughout the Dominion. It is estimated that the marble used in the buildings in Vancouver has a total value of \$5,000,000, and with rapid development of the country the prospects for the development of an important industry in the quarries of Texada Island are promising.

### Demand for Cut Stone Grows

Libraries, school and church buildings throughout Kansas are causing a large demand for cut stone, according to J. R. Sargent, of Topeka, one of the oldest and best-known cut stone contractors of that state. Calls for the stone of which a majority of the buildings of this kind are constructed, are more numerous than general during the winter. "Dealers are not experiencing any difficulty in filling orders," said Mr. Sargent, "but they are receiving all they can supply." Work on the buildings has been delayed in some places, but weather interference has not been sufficient to cut down the sale of stone materially.

### Substitute for Foreign Lime

A firm of importers in New York which was receiving high-priced lime from Germany and Austria, according to Commerce Reports, has found in this country a lime which is a good substitute for the foreign product. It is used for abrasive purposes, principally as a cleaner before nickel plating, or in combination with other materials for buffing purposes on nickel-plated work.

## A Modern Crushing Plant



Of all branches of the stone industry, the production of crushed rock requires the greatest amount of care for economy in handling because of the small margin of profit. A very complete and modern equipment is that of the Temescal Rock Company located near Corona, Cal. The situation in Temescal Canyon provides a slope that offers exceptional conditions for handling the product by gravity. The first unit of the plant now completed will have an initial capacity of 1,500 to 2,000 tons of crushed rock a day. This capacity may be doubled and trebled if the market justifies with very little interference in the operation of the first unit. The company is also per-

place of the two trains. Then, if the power goes off, as it sometimes will, there is a minimum of quarry rock in the chute.

The initial crusher of the Blake jaw type will receive a 10-ton piece of rock and break it down to a maximum of 10-inch pieces in less than two minutes, which is its justification, because it eliminates all sledging and nearly all reblasting in the quarry. The capacity of this machine is rated at 600 tons an hour, so without duplicating it the capacity of the plant may be trebled.

The product of the big jaw crusher slides down into a No. 9 gyratory crusher, which further reduces it to three and a half inch maximum pieces. The product from this machine is carried by a belt conveyor to revolving screens, which takes out all that is broken to two inches or less, and the portion over two inches in size is fed down to large disc crushers, from which it does not escape until it is finished by being broken to two inches or less in size. The finished product is carried on a belt conveyor from the scalping screens and disc crushers to the sizing screen over the storage bins, where it is separated into the various commercial sizes. Those sizes of smallest volume are conveyed by chutes

### A CRUSHED STEEL STONE PLANT NEAR CORONA, CAL.

fecting plans for installing cableways to load large rocks up to 12 tons in weight for riprap and sea wall construction. This installation will also be in unit, each with a capacity to load one thousand tons of rock a day on railroad cars, and it has room for five units of this plant.

There are many interesting features in the operation of this quarry and crushing plant. The rock is an altered rhyolite porphyry. The quarry faces extend along the mountain side, both north and south of the head of the crushing plant. While one end of the quarry is being drilled and blasted, the broken rock on the other end is being loaded into cars and hauled to the crusher. A powerful steam shovel loads the broken rock into all-steel dump quarry cars. These cars are operated by electric motors, receiving current from a third rail. By a system of levers in a tower over the crusher, operated by one man, an empty car is sent to the steam shovel, and when loaded, brought back and spotted at the chute to the initial crusher, into which the load is dumped by pulling another lever. Thus, one man takes the place of six men necessary to operate two trains of cars hauled by donkey engine locomotives, and four cars, operated singly, take the

### THE LIDGERWOOD HOIST

direct into the bins nearest the screen, and those of larger volume are carried by shuttle belt conveyors to bins farther away.

As the quarry floor is located on the side of the mountain, and all of the heavy crushing machinery is located just below the quarry floor, it has been necessary to install a special incline arrangement for handling this crushing machinery. The incline is about 48½ per cent. and 550 feet long. The design of same was such that the loaded cars which were received from the railroads were hauled directly to the quarry floor and unloaded there by means of a large traveling crane. It was therefore necessary to unload the material at the bottom of the incline, and the expense of rehandling was thus not incurred.

Owing to the unusual loads and the steep grades, it

was necessary to design a special arrangement, which is rather unique, in that a sheave car precedes the railroad car, and is attached by means of two 1¾-inch plow steel ropes to a barney car located behind the railroad car. The sheave car provides for three parts of rope in order to take care of the unusual stresses developed, and to keep the size of the hoist equipment to a minimum.

The Barney car is of the Lidgerwood Manufacturing Company's standard design, built throughout of structural steel, and operates on a standard gauge track instead of a narrow gauge track, as is the common practice. Switching arrangements are provided at the bottom for getting the barney car out of the way while the railroad car is being located at the foot of the incline.

The hoist was built by the Lidgerwood Manufacturing Company and is shown in the accompanying photograph. It is a large single-drum two-speed outfit, drum being 66 inches diameter, 44-inch face, equipped with a very powerful post brake. It is geared by means of steel gearing, to a General Electric Company's slip ring type, 75 H.P. motor, the latter being equipped with solenoid brake sufficiently powerful to bring the entire system to rest in case of failure of the current supply. The design is such that loads may be either hoisted or lowered electrically, that is, when a loaded car is being lowered the motor will act as a generator and will return the current to the power circuit. Loads of 131,000 lbs. have been hoisted to the quarry floor without any difficulty whatever.

At the conclusion of the construction period, the three-part arrangement with the sheave car and the barney car will be dispensed with, and the hoist will operate with a single line to a supply car for hauling the usual quarry supplies to the quarry floor.

### Stone Resources on the Santa Fe

The freight and passenger department of the Santa Fe Railroad has given a list of stone deposits along the line of that railroad, some of which have not heretofore been noted. A deposit of granite at Perris, Cal., is being developed and used in Los Angeles by Norris & Son. A fine gray granite occurs at Prescott and has been much used for building purposes in that section. Rather extensive deposits of marble have been located but as yet its only use has been for cement manufacture and similar industries in which marble or limestone is used. One of the most extensive marble deposits suitable for building purposes is that located at Cadiz, Cal. This has been developed sufficiently to ascertain its possibilities but actual production has been retarded by litigation. Other undeveloped properties are located at South Ivanpah, Cal., Bouse, Ariz., Victorville and Mentone, Cal. There occurs at Mayer, Ariz., a deposit of onyx that has been described at length in many of the

geological hand books as noted for its quality and variety of color. A very extensive deposit of red sandstone is located at Flagstaff, Ariz. Many public buildings have been finished in this stone, the most noted being the federal post-office at Los Angeles, Cal. There are also large deposits of tufa and volcanic ash. The best of this seems to be at Wickenburg, Ariz., which has been used in building a great deal in Phoenix. At Kirkland, Ariz., the stone ranges from white to pink and seems to have great possibilities, although it has not been developed as yet. A deposit of tufa is reported to exist south of Ludlow, Cal., but it is still in the perspective stage.

### Death of a Prominent Stone Man

The announcement is made of the death at San Francisco on March 24th of John D. McGilvray, one of the most prominent stone contractors and quarrymen of the Pacific Coast. Mr. McGilvray was born in Scotland in 1847. He came to New York in 1868 and in 1873 he removed to Chicago. In 1879 Mr. McGilvray made his home in Denver, where he served on the City Council for eight years. Later he removed to San Francisco and took a most prominent part in the building activities of that city. He operated extensive quarries, including the great building granite quarries at Raymond. Mr. McGilvray constructed many of the finest public and private buildings in the far west and at the time of his death was completing the city hall and other features of the civic centre in San Francisco. He was widely known to the stone trade throughout the country.

### Giant Statues of Easter Island

In the crater of Ronororaka, an extinct volcano on Easter Island in the Pacific Ocean, there may be seen several vast images which are as remarkable in their way as the world-famous Sphinx of Egypt. These images must have been hewn or carved out of the gray lava rock, but no one can tell who were the sculptors. However, it is plain they must have been men of marvellous patience and industry. Some of these huge heads still stand upright; many have been upset; a few are placed on platforms, and in several cases a good deal of the bust has been carved as well as the head.

### Spaniards in Cape Ann Quarries

A new race of men has come to Cape Ann to work at the granite industry. They are Spaniards from the Province of Santander in the extreme north of Spain, bordering on the Bay of Biscay. They are a robust appearing race of young fellows, with all the vivacity of their virile race. Although they are new on Cape Ann, yet their countrymen were the first European pioneers in America.

# STONE

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THERE has just come to trial the first case in New York State of a workman refusing compensation from his employer and suing others, blaming them for his injuries. The workman was injured by the collapse of a garage in Oswego. The employer had taken out insurance, but when the insurance company offered to settle with the injured man, the latter refused and sued the construction company in charge of the job for a much larger amount. This case opens up an interesting question that will be closely followed by employers of labor affected by the new compensation laws.

A LOCAL newspaper gives an account of the development of a marble quarry in its neighborhood. After describing the opening of the quarry and its equipment, it quotes the operator as expressing the hope that someone will soon invent a practical electric-driven channeller. The quarryman declares that so far none has been perfected and he is compelled to use a steam machine, although fuel is very costly in his vicinity and there is available a plentiful supply of electric power. This illustrates the importance of reading trade papers. There are electric channellers on the market and they have given good satisfaction, as the columns of this magazine have shown many times. In this day, when efficiency is the watchword and competition is so keen that the best available methods of production and operation are a necessity, the man who does not make every endeavor to keep up with the times by reading the journals that are specially devoted to his own line of business, is sure to be left in the rear guard. The trade journal that is worthy of the name is no longer devoted to personal gossip and to puffing its advertisers. It discusses possible new markets and it sets forth every improvement in methods of manufacture and merchandising. There are always a few individuals and firms who are so self-sufficient that they feel that they can dispense with such an essential aid as a trade

journal. They may depend upon the loyalty of old customers with whom they have had relations for years, but they cannot hold them forever. Failures, changes in personnel, or the infusion of new blood into moribund concerns may make it necessary for these staid and conservative business houses to seek new customers. When such a time comes, they are lost indeed, for they have taken no pains to follow the trend of modern business.

A MEMBER of the Granite Cutters' Union of Quincy, Mass., takes the Boston newspapers to task for their ignorance of the granite industry. He declares that the journals of the Hub in discussing the labor situation continually confuse the quarrying and the cutting end of the business. He instances the case of one paper that illustrated a new story telling of the suspension of the granite cutting industry in Quincy with a photographic reproduction of a quarry, thus giving rise to the inference that the Quincy quarries were shut down as well as the manufacturing plants, when, as a matter of fact, the Quincy quarry workers and owners settled their difference before the expiration of the old agreement and, consequently, with no break in the continuity of the operations. If one wished to illustrate the strange lack of information possessed by the majority of newspapers with regard to everything pertaining to stone, it would not be difficult to multiply instances far more striking than this. There is scarcely a newspaper published that does not constantly mistake one stone for another. One would think that Indiana limestone had been written and talked about enough to become familiar, and yet one constantly sees reference to "sandstone from Indiana" used in some important building. Indeed, we have even seen in the geological reports of a distant state a reference to the great "sandstone quarries of Indiana."

## Shams in Our Court House

It is announced that a number of modifications will be made in the plans for the proposed new court house in New York City with the idea of reducing the cost. There has been considerable criticism of this proposed structure on the grounds that it calls for the expenditure of many millions of dollars at a time when the finances of the city require an economical administration. There might be little objection to a reduction in the cost of the building if the economies were practiced in a sensible way, but the proposals seem to be according to the famous old method of "saving at the spigot and wasting at the bunghole."

There has been a great deal of confusion in the manner of condemnation of land for the site of the building and a number of properties have been taken that are declared useless for the purpose. In addition to this, a commission has been retained with large salaries and expensive rented quarters, which has used up hundreds of thousands of dollars and has produced no

useful results. Now that the pruning knife is at work, the proposed economies are just in the line of what might be expected. When the New York politicians get to work on a scheme of this kind they seem to think of nothing better than the substitution of imitations in the place of honest materials. Those who are familiar with the ordinary procedure of the makers of these imitations, with their political affiliations and their insidious methods, will not be surprised at the line some of the economies have taken. It is proposed to substitute cast stone for granite in "inconspicuous places." There is no exact definition of just where these inconspicuous places are, except the capitals of columns. Another proposition is that marble tiling for the floor be replaced with terrazzo. The citizens and taxpayers of New York should enter a decided protest against the wasting of their money in any such way as this.

If it is desired to reduce the cost of the building, this can be done in a legitimate manner. No one will be inclined to take exception to the elimination of statues from the exterior if the city is not prepared at present to go to the expense of such features. They can be added at any time when the treasury is in a more plethoric condition. The proper method of economy is to modify the design and cut out something of the ornamentation.

Instead of this, it is proposed to cheapen the materials where it is hoped that the substitution may not be noticed. The experience of the city in the construction of the Municipal Building should be illuminating. In this instance, it was also proposed to cut down the bill by substituting imitation stone in place of granite for the arcades, where it was hoped that the critical eye would not detect the counterfeit. But the imitation did not last even until the entire building was completed. It began to crack and scale, and constant repairs have been necessary. With all of the care bestowed upon it, it can never be made to look creditable. It is hard to believe that any intelligent taxpayer could look at this work and then consent that his money be wasted in a similar manner on a building that is intended to be for all time a credit to our great city.

Apart from all questions of economy and expediency, the ethical and moral point of view should be taken into account. A court house stands as the representative of right, truth and justice. Within its walls are to be tried those who defraud or are guilty of false pretense. With what sense of equity can the judge mete out punishment to the petty offenders when they reflect that the commissioners have foisted a fraud upon the taxpayers and given them a cheap imitation product instead of the genuine article. Perhaps they go on the theory that as long as Justice is proverbially blind it makes little difference what sort of a dwelling place is provided for her. There is always the chance, however, that the taxpayers may finally be aroused, and that they may demand that they be given a fair equivalent for their money.

### Building Stones of Great Britain

For its size, England is by far the richest country in the world, mineralogically speaking, for it contains in ample quantity, and sufficiently near the surface to be workable, a wonderful wealth of minerals, including all known main classes of building stones, and, generally speaking, many varieties of each, says an English exchange. Within its confines are to be found granites, slates, sandstones and limestones, all easily quarried and in common use, and ranging from the hardest and strongest to the softest and weakest of each. So great is the variety, indeed, that there are hundreds, if not thousands, of small quarries scattered up and down the country, producing stones of considerable value in their own locality, which can only in a general sense be said to belong to either of the main groups. Their use is not to be deprecated on that score. Local experience in such cases is the surest guide as to the purposes of their employment and the beds from which the most suitable stones are procurable; while there are numerous instances where material of the highest grades is thus obtainable, which would secure a large market if only the supply were sufficient to warrant its being sought.

### The Quarry Industry of New York

The University of New York has just published a report prepared by David H. Newland, assistant state geologist, on the quarry materials of New York. The extraction of stone for building and other purposes in this State has gained prominence as an industry only within relatively recent years. The use of stone in structures, however, goes back to the colonial period. As the most available of the permanent structural materials, it was employed by the early settlers in walls and foundations and occasionally for entire buildings. Of the latter work there still exist good examples in many of the older communities, where they have stood for two centuries or more. The stone for the early masonry was seldom quarried from solid ledges. Very little of it was cut or otherwise prepared, but it was mostly laid as rubble work. Field stones were the kind mainly used, as they were nearly everywhere abundant and the cheapest to secure, and their removal from the land was desirable from an agricultural point of view. These stones are not indigenous to the locality of their occurrence, but with the soil in which they are found were transported from a more northerly latitude in the sweep of the Laurentian ice sheet that finally extended over the whole State—and in some remote future will do so again. The boulders consist of granite, gneiss, sandstone and other rocks hard enough to resist the erosion of ice and water, and of a durability tested by thousands of years of exposure to the weather.

There seems no certainty as to the place or time of the first regular quarry operations. Very likely the earliest work was somewhere in the Hudson Valley section and the quarrying of limestone for the manu-



facture of lime suggests itself as the object of the first steady production of stone. Limestone was also required for the making of iron, which was established on a permanent basis in the State about 1751 when a furnace was built in Orange County. At the beginning of the last century the manufacture of lime had become an important industry in the Hudson River Valley. About 1820 the manufacture of natural cement was started in Ulster and Onondaga counties, the basis of the industry being an impure limestone, which by calcination and grinding makes a high-grade hydraulic cement. From the beginning New York State held a prominent place in the cement industry. About the year 1900 the output of natural cement began to decline, owing to the cheapening of the cost of Portland cement. The construction of the Erie Canal gave an impetus to the quarrying of stone, since considerable quantities of dimension stone were used in the canal locks. It also afforded means for the conveyance of stone from the central and western parts of the State to the more thickly settled region in the East. Thus the Medina and Onondaga building stones were made available. By 1840 there had developed a considerable trade in flagstone. The growth of the quarry industry was particularly rapid in the decade from 1890 to 1900. The total production had reached in value \$6,763,054 by 1913.

### Reported Marble Quarry Sale

It was locally reported during the past month, although without official confirmation, that the Gouverneur Marble Company had purchased the Northern New York Marble Company's properties, through the Jefferson County National Savings Bank, who bid in the property at the time of the mortgage foreclosure sale last fall. This includes the Northern New York quarries and plant, and the property known as the Empire Quarry. The Empire adjoins the Northern New York and is considered a valuable property. This was owned individually by George B. Massey, the President of the Northern New York Marble, and was quarried by that company from 1904 to 1914. The entire property contains a very high grade of extra dark blue stone.

The Northern New York Marble Company was organized in 1890, with George B. Massey, President. D. J. Whitney was manager for a number of years, and was succeeded by A. M. Jepson. About 1912 the company had a disastrous fire which destroyed their plant, only a part of which was ever rebuilt, and a good deal of their sawing was done at the Gouverneur Marble Company's plant.

### Decreased Building Operations in Canada

According to a report by Consul General John G. Foster, Ottawa, building in Canada in 1915 showed a heavy falling off from even the dull conditions of the

previous year, as will be seen by the following figures for the principal cities: Montreal building permits in 1915 were \$7,495,000, against \$17,619,000 in 1914; Toronto, \$6,651,000, against \$20,672,000; Vancouver, \$1,593,000, against \$4,484,000; and Winnipeg, \$1,826,000, against \$12,160,000. While, however, building trades suffered a serious loss of employment, numbers of men in these trades secured work at other employment, and at their regular occupation in rural districts where a fair amount of activity was noticeable once good crops were assured.

The effect of this decrease in building operations is naturally reflected in the falling off of stone production. According to the figures just made public, the total stone output of Canada in 1915 was only \$4,504,599, as compared with \$5,369,056, a decrease of nearly \$1,000,000.

### Increased Demand for Canadian Asbestos

Before the outbreak of the European war over 50 per cent of Canada's asbestos was shipped to Germany and Austria, writes Consul Felix S. S. Johnson, from Kingston. When war broke out the two big asbestos corporations doing business in Canada found matters almost at a standstill. In a surprisingly short time they found a new and larger market for their entire output, with the result that the sales of the Asbestos Corporation of Canada increased 12½ per cent. over those of 1914, while the Black Lake Asbestos Co. turned a deficit of \$32,000 in 1914 into a profit of \$20,000. Prior to the war asbestos was used largely for industrial purposes, such as the making of shingles, fireproof boards, fireproof curtains for theatres, covering for machinery, etc. Today Canadian asbestos is finding a market in Great Britain, where it is being used as packing, for the covering of boilers and piping in the new ships built, and for other purposes.

### A Novel Memorial

A strange memorial is to be erected over the grave of the members of the Con. T. Kennedy Shows who were killed in a train wreck near Columbus, Georgia, last November. The memorial, which is to be of Georgia marble and is to be cut by the Elledge & Norman Marble Company of that city, will take the form of a circus tent, showing the main entrance with ropes down the sides and all of the details of the seams in the cloth, worked out with great care.

### Plans for Extensive Road Building

Frank E. Bogardus, the Onondaga County superintendent of highways, has made plans for a great deal of road construction during the coming year. Many thousands of tons of crushed stone will be required for this work. Although not many contracts for large quantities of stone have yet been signed, it is likely that much of it will come from the big quarries at Jamesville, N. Y. These are operated by the Rock Cut Stone Company, which also has a large quarry at Auburn. The company has a very complete equipment and has shipped



hundreds of thousands of tons of stone through the southern part of the state.

### Business Brevities

A bill is pending in the House of Representatives at Washington, D. C., introduced by Congressman John J. Fitzgerald, of New York, appropriating \$100,000 for the erection in the Capital City of a shaft in memory of John Ericsson, inventor of the Monitor.

A community mausoleum, costing \$40,000, is projected at Puyallup, Wash.

The office and storeroom of the Erie Stone Company, near Bluffton, Ind., was destroyed by fire the past month with a loss of \$5,000. Some frozen dynamite was placed near the stove to thaw, burned but did not explode.

The Wisconsin Crushed Stone Association has opened an office at Division and Main streets, Fond du Lac, Wis. The association was recently formed for the purpose of promoting the use of crushed stone in Wisconsin. It is made up of many of the most prominent quarrymen of that state.

A movement is on foot to erect a monument to the memory of Dante, the Italian poet, by the Italian Club of Syracuse University.

G. Fred Johnson, of the Endicott-Johnson Shoe Company, will erect a fine mausoleum at Johnson City, near Binghamton, N. Y. The structure will be about sixteen feet square and will have an exterior of Barre granite and an interior finish of Vermont marble. It will cost about \$10,000.

A bill is before the New York Legislature making an appropriation of \$1,500 for a monument on the Antietam Battlefield to commemorate the part played there by the Wadsworth Guard, known as the 104th New York Volunteers.

The plant of the Granger Lime & Marble Company, at West Stockbridge, Mass., was destroyed by fire during the past month with a loss of about \$20,000. The plant had recently installed a large amount of expensive machinery.

A highway to cost \$600,000 is to be built from Ottawa, Canada, sixty miles south to the St. Lawrence River international boundary. It is stated that the road is to be built as a memorial to the late J. P. Whitney, premier of Ontario.

A fund is being raised in Syracuse, N. Y., for a Lincoln Memorial to be erected in Lincoln Park, provided that it will not cost less than \$50,000.

The United States Consul-General of Ottawa telegraphs that the exportation of asbestos has been forbidden to all except British countries, except under license. He declares, however, that he is assured that licenses will be granted for shipments to be consumed in the United States.

The Spanish War Veterans of Cohoes, N. Y., are discussing plans for the erection of a monument to the heroes of that war.

A committee of citizens of Gloversville, N. Y., has been formed for the purpose of raising funds for a soldiers' monument to cost from \$10,000 to \$12,000.

Schenectady, N. Y., is raising a fund of \$2,600 for a monument to those who took part in the Spanish-American War.

The contract for the cut stone for the Lewis H. Morgan School at Rochester, N. Y., has been awarded to the Consolidated Cut Stone Company, of that city.

### Quarry Notes

A boulder weighing more than three tons that was being drilled for blasting in the quarry of the Lehigh Portland Cement Company at Ormrod, Pa., broke from the bank and rolled to the bottom of the quarry. It passed over one of the workmen and crushed him to death.

A. J. Haws & Sons, of Johnstown, Pa., have opened up the ganister quarries near Lewiston, Pa. A hundred men are

already employed. The product will be sent to Johnstown to be made into brick for furnace linings.

Nast Brothers have bought a tract of forty acres of land at South Germantown, Wis., and will crush stone and burn lime.

It is locally reported that the Green Quarries at Green Bay, Wis., may not be operated the present year. The company has contracts on hand for only 12,500 tons of stone for delivery this year, while the plant has a capacity of about 5,000 tons a month. About 60 to 80 men are employed. Adolph Green, who has been the head of the Green Stone Quarry Company and the A. G. Green Construction Company, has recently retired from the business and has turned the affairs over to his children.

The Leathem & Smith Company, of Sturgeon Bay, Wis., has been awarded the contract for furnishing stone for harbor work at Manistee, Mich. The job will require in the neighborhood of 28,000 tons of stone and will take a couple of years to complete. The local firm was given the contract to furnish the stone by Mr. Ginzel, of Detroit, Mich.

While 4,000 pounds of dynamite was being thawed by steam at the plant of the Indiana & Ohio Stone Quarry, three miles from Greencastle, Ind., it exploded and wrecked the mill. About one hundred men were employed in the quarry at the time, some of them within fifty feet of the dynamite storehouse, but none was seriously injured. The shock was felt for twenty miles.

The city of Yonkers has awarded a contract for 8,000 cubic yards of trap rock to the New York Trap Rock Company.

The East St. Louis Stone Company, of East St. Louis, Ill., has recently closed a contract for furnishing about \$40,000 worth of crushed stone for road building in that vicinity.

Colonel J. H. McConlogue has been delegated by the Iowa State Board of Control to take charge of the State quarry, which will be operated in Lyon County as a prison industry. Prisoners from Anamosa Reformatory will be used at the quarry, and it is expected that by autumn fully one hundred men will be employed. An improved equipment will be purchased. At first the prisoners will be quartered in tents, but it is expected that permanent buildings will be erected later.

### New Companies

The W. L. Morrison Stone Company, of Clarksburg, W. Va., to quarry stone. Capital, \$25,000.

The Washington Quarries Company, of Northport, Stevens County, Wash., to quarry and deal in marble. Capital, \$1,000,000. Incorporators, H. C. Malcolm, F. B. Kruse, Byron Jones.

The Virginia Alberene Corporation, of Richmond, Va., to quarry and manufacture soapstone. Capital, \$1,000,000. Andrew D. Christian, president; W. A. Stratta, secretary and treasurer, both of Richmond, Va.

The Bloomington-Bedford Stone Company, of Louisville, Ky., to manufacture and deal in stone. Capital, \$75,000. Incorporators, David C. Peyton, Hesse Runyan and William Mentz.

The Mountain Granite Company, of Mountain, Wis., to quarry and deal in granite. Capital, \$10,000. Incorporators, Martin Olson, William Green, and L. B. Van Rossun.

The American Rubbing Stone Company, of Floyds Knobs, Ind., to make rubbing stones. Capital, \$30,000. Incorporators, H. C. Perrette, L. B. Perrette and F. I. Koehler.

The South American Columbian Marble Company, of New York, to quarry and deal in marble. Capital, \$??,000. Incorporators, J. M. and A. V. Lamadrio, 258 Broadway, New York City.

The Community Mausoleum Company, Inc., of New York, to erect mausoleums, etc. Capital, \$200,000. Incorporators,

A. B. Squire, Orange, N. J.; F. N. Kendal, 221 Bergen Street, New York City, and J. C. Cortz, Cuyahoga Building, Cleveland, Ohio.

The Salisbury Granite Corporation, of Salisbury, N. C., incorporated under the laws of Delaware for the quarrying of granite. Capital, \$25,000.

The Smoot Sand & Gravel Corporation, of Washington, D. C., to quarry sand and gravel. Capital, \$300,000.

The Virginian Limestone Corporation, of Ripplemead, Va., to quarry and deal in limestone. Capital stock, \$400,000. Charles A. Klotz, president; Edward W. Agnew, secretary, both of Chicago.

The American Monument Company, of Cleveland, Ohio, to manufacture and deal in marble, granite, etc. Capital, \$15,000. Incorporators, Jas. Broggini, E. E. Rich, C. L. Broggini, Joseph J. Olsey, James L. Broggini, Jr., and Charles Tesar.

### Notes from the Stone Fields

#### MARBLE AND GRANITE

The South Plains Marble Company has been organized and will open a plant at Plainview, Hale County, Texas. T. O. Collier will be the manager.

The granite quarries at Ableman, Wis., are taking on more men and a very busy season is expected.

The Siesholtzville Granite Company, of Allentown, Pa., will supply the stone for the new high school building at Lehigh-ton, Pa.

The Dixie Gray Marble Company, of Knoxville, Tenn., has been incorporated with \$50,000 capital to quarry and sell marble.

The contract for the marble balustrade at the new library in St. Paul, Minn., has been awarded to the Trenton Manufacturing Company, of that city, for \$28,805.

The United Marble Company, which operates the Green Mountain Marble Company's plant, has leased from Geo. C. Underhill and Frank White, of Rutland, Vt., the so-called Kelley marble property in South Wallingford, Vt.

A contract has just been signed with the Mt. Nebo Marble Company, of Salt Lake City, Utah, for \$19,054 for the interior finish of the new church building on South Temple Street in that city. This does not include the finishing of the large reception room, with its sixteen columns. It has not yet been decided whether Utah marble, foreign marble or Sanpete stone will be used in the reception hall. The present contract brings the cost of the interior finishing up to nearly \$60,000. In case Utah marble is used for the columns, the cost will be \$80,000.

The Board of Estimate of New York has appropriated \$900,000 for paving certain streets in Manhattan. Granite paving block will be used for paving eighteen streets.

Emery Roth, architect, of Bing & Bing's new 13-story apartment house, on the corner of Park Avenue and Sixty-third Street, New York, says that the owners in this case are making a radical departure from the prevailing custom of designing buildings in that they are erecting the building in harmony with its surroundings. The other half of the block is occupied by the Colony Club, in red brick and marble in the Colonial style. The new apartment will be similar, and the marble work on the first two stories is identical in design with the Colony Club, even to the extent of carrying through the stone courses.

The Grand Rapids Marble & Fireplace Company has been awarded the contract to furnish the marble interior finish for the new Steketee Building at Grand Rapids, Mich.

The very large increase in demand for Napoleon Gray Marble, and in particular for floor material made from this product, made it necessary for the Phenix Marble Company to close down its mill for a period of thirty days for the erection of a new central power plant. New boilers, engines and

generators have been installed and are now in operation, so that the company will be in a position to take care of the increased demand this year without further interruptions.

Alexander Milne, Alfred C. Simpson, John P. Corskie and John C. Booth have organized the Littlejohn & Milne Quarry Company, Inc., of Barre, Vt., with a capital of \$50,000. The company has purchased the Littlejohn & Milne quarry on Millstone Hill, Barre. The quarry consists of thirty-four acres, and up to the present time only about three acres have been opened up. The quarry was started by Littlejohn & Milne sixteen years ago, and more recently was operated by George Libersont. For the past year, however, it has not been worked. The stock is light and medium. All of the men con-

#### ANCIENT BELGIAN STONEWORK

Windows and parapet of Cloth Hall at Ypres. This and the following three illustrations are from the *London Architect*

nected with the new organization have had long experience in the granite business.

Johnson & Gustafson, granite manufacturing firm, of Barre, have let the contract for a large modern granite-working plant. The main shed will be 180 by 50 feet, and there will be a two-story office, 24 by 18 feet. The business of the company has outgrown its present quarters.

#### LIMESTONE AND SANDSTONE

Contracts have been let for the installation of electricity in the large stone quarries of the J. E. Baker Company, at Billmyer, several miles west of Marietta, Pa. A York company will do the work at once. The quarries have been operated by steam heretofore.

The Michigan railroad commission is considering a protest made by the limestone quarries of that state for a reduction of rates on their product for long hauls.

A number of Canadian contractors have led charges with the Interstate Commerce Commission that the Illinois Central, Big Four and B. & O. railroads, operating in Southern Indiana, are charging rates on rough and sawed stone from the Bedford quarry district to Canadian points in excess of the 5 per cent. increase allowed them.

The plant of the new Gouverneur Limestone Company, at Gouverneur, N. Y., is now in steady operation, with orders on hand for quite a period ahead.

A new building is to be erected for the Greek Orthodox Church of St. Constantine, on Schermerhorn Street, Brooklyn, N. Y. It will be of the Greek Byzantine type. The plans are by Partt Brothers. It will have limestone trim.

Architects Starrett & Van Vleck have prepared plans for a \$1,000,000 building to be erected at Madison Avenue and Forty-fifth Street, New York, for the Abercrombie & Fitch Com-

pany, dealers in sporting goods. The Phipps Estates, which owns the property, will build it. Work will start about May 15th. The structure is to be eleven stories high, in the Italian Renaissance style. The first two stories of the exterior are to be of Indiana limestone.

Announcement is made locally that the mill of the J. Hoadley & Sons Company, of Stinesville, Ind., which was recently destroyed by fire, will be rebuilt at Bloomington in the south part of the town. The erection of the mill is to be pushed as fast as possible and the stone foundation will be put in by the Hoadley company itself, the work to be started at once. The city of Bloomington will extend the water mains and open a new street for the benefit of the mill.

#### SLATE

The Slate & Tile Roofers' International Union and the American Brotherhood of Slate Workers have reached an

the production is estimated at 60 per cent. less than in 1913. While list prices are being adhered to, the discounts vary considerably. The only overseas demand for slate reported in one district is that from Australia. In one big quarry, however, the demand for slates at present is considered to be about normal. Germany was the best foreign customer for Welsh slates before the war, and always purchased the very best old vein quality. It is said that the German merchants owed some £20,000 to the slate quarry proprietors of Festiniog, and this large sum was, of course, lost to these firms in consequence of the declaration of the war with Germany. The quarry proprietors are, naturally, anticipating that they will be called upon to meet a Continental demand of considerable magnitude as soon as rebuilding commences in Flanders and the North of France, and are hoping that their inflated stocks will then be satisfactorily disposed of.

The imports of slate into Great Britain for the last three years have shown a consistent decline. For 1913 the quantity was 17,601 tons, in 1914, 9,949 tons, and last year, 4,087 tons.

A peculiar and fatal accident occurred in the Rising & Nelson slate quarry near Granville recently. The superintendent of the quarry, Griffith J. Hughes, and William L. Lewis, both of West Pawlet, had gone to the dump heap to look at a stone from which it was thought slate could be made. At the time a large piece of rock was being hoisted from the pit. When it reached the proper distance the engineer, who could not see the two men, loosened the clutch and the rock fell directly on the men, killing them instantly and crushing their bodies in a horrible manner.

#### A New Granite Saw

A newspaper published in Lynn, Mass., gives an account of a new granite saw invented by a man in that city after four years of experimenting. According to the description, two uprights about six feet in height with a worm gearing on each side control the saw, allowing it to automatically cut through six inches of granite each hour. An electric motor furnishes power to drive the saw back and forth by means of an arm and piston. Instead of a single solid blade, as is used in other granite saws, there are six cutting blades, each four inches apart, four inches in width and eight inches long. The cutting, which is more or less of a grinding operation, is accomplished by the use of chilled iron shot and a stream of constantly flowing water. The machine does away with the services of three men, as but one is necessary to keep the cutting groove well supplied with shot. It cuts smooth, and in further finishing but one hammering is needed instead of two or three, as was formerly required to finish the stone.

#### Construction Notes

Wheeler County Court House at Alamo, Ga., was destroyed by fire the past month. It will be rebuilt as soon as possible.

Plans are being drawn for what, it is declared, will be the largest hotel in the world. This will be erected adjacent to Times Square, New York, will be twenty-eight stories high and will contain 2,500 rooms. The cost of the site and structure will be approximately \$15,000,000. The completed edifice will be nearly twice as large as any existing hotel, and it has already been named the Commonwealth. The plans are by Starrett & Van Vleck and Beverly S. King and Shiras Campbell. The general design of the buildings is to be carried out in Italian style. The lower stories are to be of limestone, above a polished granite pedestal course.

St. Mary's Congregation of Oswego, N. Y., will build a new church after plans by John T. Comes. It will be of English Gothic design and will be erected of local field stone.

Plans have been filed with the building department of New York for a six-story private dwelling to be erected on Sixty-sixth Street, near Madison Avenue. It will be in Colonial

#### THE ABBEY CHURCH OF MESSINES

Interior of the choir of a famous old church in Belgium, a few miles south of Ypres

agreement whereby the slate workers relinquish to the Slate & Tile Roofers' International Union the right to erect or apply roofing slate to roofs or sides of buildings.

The North Wales industry of quarrying for slate and manufacturing the rock for its various uses has suffered largely owing to the war. This was but to be expected, for probably 90 per cent of the slate obtained from the quarries in the Snowdon region (where the beds chiefly lie) is cut into roofing sizes, and the war almost arrested building construction in Europe. Three well-known quarries were closed down more than a year ago until the end of the war, one of these being at Blaenau Festiniog, another at Carnarvon, and the third at Penygroes. The output generally for 1915 was considerably less than before the war, and the home demand for slates is such that at many quarries the prospects for the present year are anything but cheerful. In one great quarry

style with a façade of limestone and brick, including massive Corinthian columns. The architects are Hoppin & Koen.

The contract for the erection of the new federal building at Batavia, N. Y., has been awarded to George C. Rossell, of Rochester, his bid being \$57,993 for limestone construction.

Ulrick & Hoffman, of Brooklyn, have prepared plans for a nine-story apartment hotel to be built by the Eighty-two Pierpont Street Corporation at Pierpont and Henry streets, Brooklyn. The structure will cost \$250,000. There will be a front of brownstone for the first two floors, while the other stories will be of brick with limestone trimmings.

Jordan Green has completed a sketch for the proposed civic center to be built around the present City Hall at Newark, N. J. This includes a four-story police headquarters of white stone and yellow brick.

St. Mary's Parish, Troy, N. Y., will erect a \$100,000 parochial school building. It will be four stories high, after the Gothic style of architecture. The front of the building will be of granite and pressed brick with Indiana limestone trimming.

Hayden & Hoyt, 220 Devonshire Street, Boston, Mass., are preparing plans for a three-story addition to Faulkner Hospital, Jamaica Plain, Mass., to cost about \$75,000.

The Empire Hippodrome Company will build a Hippodrome costing about \$1,500,000, at College and Teraulay streets, Toronto, Ontario, Canada.

Walter P. Crabtree, of New Britain, Conn., is preparing plans for a banking building for the Middletown, Conn., National Bank.

Hamilton, Ontario, will erect a \$50,000 library building.

The Albany Academy for Girls will build a two-story gymnasium and auditorium adjoining the school at 155 Washington Avenue, Albany. The plans are by Merrick & Pember, of that city.

The Miami National Bank of Miami, Okla., will build a \$60,000 office after plans by A. H. Mott, of that city.

St. Jerome's Church, of Brooklyn, will erect a three-story parochial school and convent costing \$100,000 at Nostrand and Newkirk avenues, of that city. The plans are by John Bagley Day, 1265 Broadway, New York.

S. Hannaford & Sons, Cleveland, Ohio, are preparing plans for a \$200,000 hotel for the Altamont Springs Hotel Company at Ft. Thomas, Ky.

The Church of the Sacred Heart, West New Brighton, N. Y., contemplates the erection of a \$100,000 auditorium after plans by F. L. Metcalf, Plainfield, N. J.

Loveland, Ohio, contemplates the erection of a \$250,000 school building.

Plans are being prepared in Muncie, Ind., for a city hall to cost about \$125,000.

The commissioners of Jay County, Ind., will receive bids for a new court house at Portland until April 27th. The plans are by McLaughlin & Hulsken, Lima, O.

The city of Oswego, N. Y., is planning to erect a high school at an estimated cost of \$200,000.

Sheldon, Ia., will erect a three-story high school to cost about \$80,000. The plans are by G. L. Lockhart, Endicott Building, St. Paul, Minn.

The Trinity Episcopal Congregation, of Collingswood, N. J., is planning the erection of a new church building.

The Board of Education of Dover, N. J., is considering plans for a \$125,000 school.

Bids will be received until May 1st for an addition to the Arrowhead Hotel at San Bernardino, Cal., to cost about \$100,000.

The Y. M. C. A. of Jersey City, N. J., is planning the erection of a \$250,000 building.

Clearwater County, Minnesota, will erect a court house at Bagley, costing about \$114,000.

The Metropolitan-Columbus Association, of Montreal, Que-

bec, Canada, contemplates the erection of a club house to cost about \$200,000.

Tracy & Swartwout, New York, have prepared plans for a three-story high school building, costing about \$225,000, for Ridgewood, N. J.

Minidoka County, Idaho, will erect a court house at Rupert.

Alfred C. Bossom, 366 Fifth Avenue, New York, will soon receive bids for a five-story bank and office building for the People's Bank at Harrisonburg, Va. The estimated cost is \$75,000.

#### CHURCH OF WERVICQ ON THE LYS

View showing the interior of the choir of a famous old structure in West Flanders nine miles from Ypres

James Couzens will erect an eighteen-story business building, costing about \$1,000,000 at Fort & Shelby streets, Detroit, Mich.

Plans have been prepared for a three-story court house, to cost \$75,000, at Pineville, W. Va.

The Mad River National Bank will erect a \$50,000 banking building at Springfield, Ohio.

The Masons of Xenia, Ohio, will erect a temple costing between \$40,000 and \$50,000.

John D. Chubb, of 109 North Dearborn Street, Chicago, has

prepared plans for a four-story high school building for Saulte Ste. Marie, Mich.

St. Paul M. E. Congregation, of Wheeling, W. Va., will erect a new church and parish house.

The Elks of Durham, N. C., will erect a \$75,000 lodge building.

M. Nippell, of Ft. Dodge, Iowa, has prepared plans for a seven-story hotel and banking building for the Iowa Savings Bank of that city. The estimated cost is \$115,000.

Menomonie, Wis., will erect a junior high school to cost about \$165,000.

Bids will be received about May 15th for a \$60,000 school

build a dormitory at Cedar Falls, by day labor at an estimated cost of \$100,000.

The citizens of Sidney, Mont., will vote on an appropriation of \$100,000 for the erection of a court house.

Coolidge & Hodgen, Corn Exchange Bank Building, Chicago, Ill., have prepared plans for a two-story agricultural engineering building at the Nebraska State Farm, Lincoln, Neb. The estimated cost is \$140,000.

The contract for the fourteen-story office building for the Leasehold Realty Company at Market and Delaware streets, Indianapolis, has been awarded to H. W. Klausmann, of that city. The estimated cost is \$175,000.

Ewing & Chappell, architects, have prepared plans for a twelve-story addition to the Bristol Hotel at 122-124 West Forty-ninth Street, New York. This will carry the structure to Forty-eighth Street, with a frontage of 75 feet adjoining the Playhouse and occupying a plot containing about 8,000 square feet. The building will be of limestone, terra cotta and red tapestry brick. T. E. Tolson, the owner, has awarded the contract for the construction to the Whitney Company. About \$500,000 is involved.

### Government Work

Bids will be received at the office of the Supervising Architect, Washington, D. C., until April 19th, for the construction of the United States postoffice at Arkadelphia, Ark., and until May 15th for the construction of the postoffice and custom house at Newport, R. I.

Bids will be received at the office of the United States Engineer, Wilmington, N. C., until April 29th, for furnishing and delivering about 14,300 tons of riprap and 1,500 tons of capstones.

The contracts for the erection of the United States postoffice at South Bethlehem, Pa., has been awarded to Thomas W. Cissel, of Worcester, Ohio, at \$71,500 and for the postoffice at Norton, Va., to the Westchester Engineering Company, of White Plains, N. Y., at \$56,897.

Proposals will be received at the office of the Supervising Architect, Washington, D. C., until April 24th, for the construction of the United States postoffice at Roseburg, Ore., and until May 8th for the construction of the postoffice at Elkton, W. Va.

### Obituary Notes

The Brainerd, Shaler & Hall Quarry Company, of Portland, Conn., announce the death on March 6th of Mr. Frank Brainerd, the president of the company. Mr. Brainerd was in the 61st year of his age, and had long been identified with the company, which is one of the oldest quarrying concerns in this country.

John Sargent, senior member of the Sargent & Son Cut Stone Company, of Topeka, and one of the most widely known building contractors in Kansas, died suddenly in that city during the past month. Mr. Sargent was a native of Devonshire, England, where he was born in 1849. He came to this country in 1870, and eight years later went to Topeka, where he had charge of the building of the west wing of the State House. During the many years that he was in the stone business Mr. Sargent built many of the most important structures in his section of the country.

### Business Embarrassments

A petition in bankruptcy has been filed against Cosimo Sorgie and Vincent Tripoli, who did business as the United States Marble Company, at 931 Courtlandt Avenue, the Bronx. It is alleged in the petition that on February 9th they transferred the entire plant to a former employee. The assets and liabilities are not given.

### AN ANTIQUE STONE SUN DEAL

A striking garden ornament carved in Portland stone, which stood until recent years in Maidenhead, England

building at Lewis, Iowa, to be erected after plans by Proudfoot, Bird & Rawson, Des Moines, Ia.

The Masons of Watertown, Wis., expect to rebuild their temple at a cost of \$75,000.

The contract for a six-story bank and office building for the Delta Bank & Trust Company at Clarksdale, Miss., has been awarded to Nicol, Langford & Johnston, of Louisville, Ky., for \$146,500.

The contract for Sheridan Hall at the Normal School at Hays, Kan., has been awarded to Sharp Bros. Construction Company, Eldorado, Kan., at \$100,000.

Bids will be received until April 17th for a \$70,000 school building at West Liberty, Iowa.

The State Board of Education, Des Moines, Iowa, will

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For use at this time of year we especially recommend Hercules E. L. F. (Extra Low Freezing) Explosives. As you know ordinary dynamite will freeze and become dangerous to handle at temperatures between 45 and 50 degrees F.

Hercules E. L. F. Explosives will not freeze until after water freezes and often remain unfrozen at lower temperatures.

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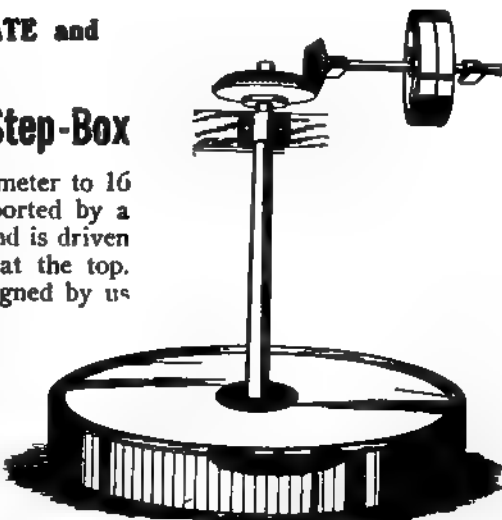
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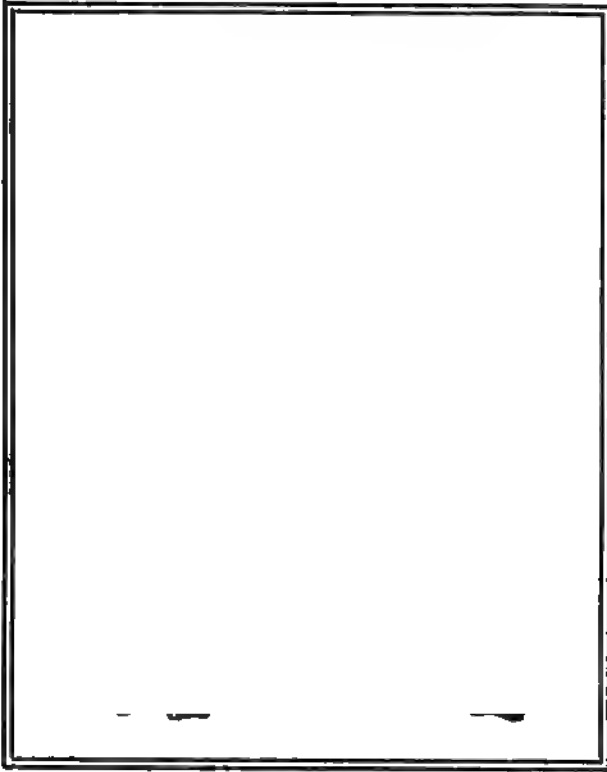
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MAY, 1916

NUMBER 5

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## Granite for Paving

 WITH the tremendous increase of heavy traffic in our cities the question of street pavements assumes an importance it never had before. It is gratifying to note that there is a marked tendency of late on the part of city engineers and boards of works to give the preference to granite blocks as representing the most durable and economical type of construction. A series of articles discussing the factors in the success or failure of street pavements has been published in *The American City*. The sixth article, on "Improved Granite Block Pavements," has been contributed by Zenas W. Carter, field secretary of the Granite Paving Block Manufacturers' Association of the United States:

"The success or failure of street pavements" must naturally be used as a relative term when applied to granite block pavements, as granite paving blocks are made from natural granite exclusively, quarried in a majority of states of the Union, and there never was a failure of granite block paving such as might be possible with certain manufactured or mixed paving materials, says Mr. Carter.

On the other hand, there are such a variety of methods used in the handling of the quarried granite blocks that what one citizen or engineer may term a good or successful granite block pavement might be termed a failure by his neighbor or fellow engineer. In order to make our statements clear, therefore, we shall largely confine them to what is known as the "Improved Granite Block"; especially as it is a fact that no citizen should permit the laying and no engineer should specify or accept a pavement of granite block which fails to result in an even surface in every way acceptable for both horse and automobile traffic.

To secure a smooth, even surface—so perfect, in fact, that no crosswalks or bridgestones are used or needed—it is necessary that the citizen require and the engineer specify a carefully made granite block having no projections on the surface exceeding  $\frac{3}{8}$  inch from an even plane, and that the blocks be laid in the street on a properly drained sub-foundation, a substantial concrete foundation, and with close, even joints, and that these joints be filled with a bituminous filler of

asphalt or pitch, or grouted with a cement grout consisting of one part cement and one part sand.

The use of the two different types of fillers is largely a question of the likelihood of future openings being made in the pavement. If frequent openings are apt to be necessary, the bituminous filler is more convenient, and where traffic conditions demand quick repair it is preferable. Where openings are not apt to be frequent or where traffic conditions would allow blocking off for a reasonable period for the cement grout to set properly, the cement grout filler should be used and will give better results usually than the bituminous filler.

To secure the best results with the bituminous filler, it is essential that specifications distinctly demand, and that inspection be so rigid, that a city will secure a block of reasonable hardness, toughness, and one that shows a proper resistance to abrasion. At the present time, there are so many methods being used and such a varied lot of tests being made that the selection of granite from some quarry which already has made a record for quality through service given in specific streets in different cities and under different traffic conditions, is undoubtedly the safest course for the engineer, unless he has satisfactory facilities for making suitable tests that he knows will provide the proper granite to meet his requirements.

When the blocks are delivered, care should be used in the inspection to see that blocks meet the specifications as to size. Blocks with uneven heads, having depressions of more than  $\frac{3}{8}$  inch depth as a maximum, should be rejected. The average citizen to-day demands, and is entitled to, an even surface pavement. Large bunches or undue depressions in the blocks make an uneven surface pavement which gives just cause for complaint regarding noise from traffic.

Granite paving blocks should never be thrown from a wagon one by one. Always use some form of dump wagon. Thousands of good blocks are spoiled for good paving every year through careless handling.

The next feature of importance is to specify and secure blocks which permit laying with even, close joints; joints for bituminous filler pavements not to



exceed  $\frac{3}{8}$  inch and for cement grout filler pavements not to exceed  $\frac{1}{2}$  inch. When blocks are laid with wider joints than  $\frac{3}{8}$  inch for bituminous filler work, the blocks will begin to "turtle" or round on all the edges within a few years, on account of the steel shoes of horses tending to chip and break off small pieces every time the calk slips into the joint. With the close, even joint, properly filled, the horses can secure good footholds when handling heavy loads, and the edges are so close together that both blocks on the sides of the joint are forced to take the strain and blow, and neither block is broken or chipped.

A slightly wider joint may be used for cement grout filler work, as the filler must penetrate well down to the bottom of the block and thoroughly bond the blocks into a monolith form.

Granite blocks vary in size in different locations, and no specific size can be given preference; but it is important to see that all blocks in any single course across the street or area being paved are of the same width; as the use of a  $4\frac{1}{2}$ -inch block in the course with a  $3\frac{3}{4}$ -inch block will leave a chance for the narrow block to become loosened, and this gives a chance for the next and next blocks to move. As a result, an opening in the joint develops and water seeps through to the concrete and shifts the cushion below or upheaves the blocks in the area through freezing in the winter. Of course, with the grout filler the danger is not so great, but it exists.

Granite blocks should not vary more than  $\frac{1}{2}$  inch in depth in any case. Much of the old-time unevenness of surface came about through carelessness on this point. Variations in length are not important, with the exception that blocks over 12 inches in length should not be used, and the variation in lengths should be sufficient to always allow for breaking the joints at least 3 inches so that ruts cannot develop from two end joints being continuous.

When laying blocks, great care must be used to see that the sand cushion or mortar cushion over the bed of the concrete is not deeper than necessary. A cushion of  $\frac{3}{4}$  inch to 1 inch is ample, and the frequent practice of using a cushion of  $1\frac{1}{2}$  inches to 2 inches should be abandoned. Before the specifications for improved granite blocks developed there was some excuse for this practice, as the blocks frequently varied 1 inch or more in depth; but engineers now know that this extra depth of block and sand cushion were the cause of much unevenness of surface.

Inspectors having charge of granite block paving work need also to insist that pavers refrain from the common practice of padding out the joints to secure yardage, especially with bituminous filler work. The contractor or city engineer, if the job be city work, should remember that although filler is less expensive than granite blocks, granite blocks are sold by the square yard laid. It is thus cheaper to lay close joints and save in the quantity of filler; the price for granite

being the same whether large or small joints are used.

After the blocks are laid in proper courses, they must be thoroughly rammed. All low blocks should be lifted and rebedded and retamped until the entire surface of the pavement is both even and firm. It is best to specify one rammersman to two pavers to insure that every block is rammed to a firm bed. The main trouble from poor ramming is that the poorly bedded blocks will go down under traffic and the surface of the pavement will soon be very uneven; while, on the other hand, properly laid granite block pavements have given service for periods of twenty years and more without a single block showing appreciable wear, or any unevenness of surface developing.

In laying granite block pavements it is never necessary to use expansion joints, although an expansion joint has been laid next to the curb in a few instances to break the monolith bond between the pavement and sidewalk and buildings on the street.

Unlike the old style rough granite block pavement, the improved block properly laid makes an even surface pavement which eliminates most of the noise of vehicles and provides an excellent surface for horse-drawn traffic under all weather conditions, while at the same time meeting the demands of fastidious autoists. Furthermore, a granite block pavement will stand all the weight and abuse which the heaviest of modern auto trucks and loads may be put upon it and last indefinitely. To secure such results, the extra care in laying as suggested in this article and the slight extra cost for granite are amply repaid.

### Cutting the Cost of the Court House

The plans for the New York County Court House, which have been an object of discussion for several years past, have been modified so that it is expected that the cost of the building will be reduced from \$10,000,000 to \$7,500,000. The reduction was insisted on by the Board of Estimate at a recent conference with the Court House Board and brings the cost of the building down to 32 cents per cubic foot instead of 41 cents as originally provided. The general architectural provisions for the buildings will not be interfered with, but the interior decorations and equipment have been materially changed. Cheaper material will be used in many instances, such as the substitution of tile for marble and the abolition of expensive wainscoting in the court rooms. Costly statues which were to have been erected at the top of the portico will be eliminated.

### Memorial to Rupert Brooke

It has been decided to set in Rugby Chapel, England, a memorial to Rupert Brooke, the poet who was killed in the war. It will be remembered that Brooke did not live to enjoy fame, as he fell in action before his genius was scarcely known. The memorial will take the form of a portrait medallion in marble, the work of Prof. J. Harvard Thomas.

# Building Stones of Ohio

By WILLIAM CLIFFORD MORSE, WASHINGTON UNIVERSITY



OHIO holds fourth place among the states in the production of stone, and first rank in the output of sandstone, in fact, some of its sandstone quarries are among the largest in the world. These facts give particular interest to a report by Prof. J. A. Bownocker on "Building Stones of Ohio," just issued as a bulletin by the Geological Survey of that state. The opening chapter, "The General Character and Properties of Ohio Building Stones," serves as an introduction to the subject by calling attention to the fact that the building stones of Ohio all belong to the sedimentary group, and that in general terms the limestones underlie the western half of the state and the sandstones the eastern half. Both the limestones and sandstones vary much in color, texture, stratification and other characters, but, all in all, are of good quality and well adapted to architectural purposes, provided they are carefully selected. In discussing the chief properties, durability, strength, color, carving, ease of quarrying, density and architectural effects of the Ohio building stones, most emphasis is correctly placed on durability—and in subsequent chapters, short histori-

cal sketches and photographs of buildings and other structures are given, to show the durability, or the lack of it, of the stone under consideration.

Limestones suitable for building stone are treated, in the order of their age, in the second chapter. The Ordovician rocks, covering the southwestern part of the state and constituting the Point Pleasant beds, the Eden shale, the Lorraine formation and the Richmond formation are composed of alternating layers of limestone and thin zones of clay shale, both prevailingly fossiliferous and blue in color. The limestone meets the severest crushing test that has yet been made by the architect or engineer, and its resistance to weathering from 30 to almost 70 years in public and private buildings demonstrates its durability. In all cases the blue color changes to a lighter one. The thin even layers make the stone well suited for building purposes, but the large amount of shale which has to be handled adds enormously to the cost of quarrying. In spite of the good qualities of the limestone the demand is so small that in the 4,000 square miles of outcrop not one quarry in Clermont, Brown or Warren

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counties was being operated in 1913, and only two or three in Hamilton County and one in Butler.

With the exception of the southwest and northwest corners, the Silurian rocks cover the western half of the state. The major divisions are the Clinton limestone, the Niagara series, the Monroe formation and possibly a shale at the base. The Clinton limestone is a crystalline stone so pure that the calcium carbonate will average over 95 per cent in the various analyses. Stratification is not a prominent feature, and the stone breaks in lenticular masses of dimensions unsuitable for building purposes. At least some of the colors, which range from white to pink and red, change to shades that are not very attractive. Outcrops are limited to a belt around the Ordovician rocks in the southwest part of the state. There are two areas of Niagara rocks in Western Ohio, a northern and a southern. The more important divisions of the series in the southern area are the Osgood beds and the West Union, Springfield and Cedarville limestones.

In the Osgood shales is a thin lentil of limestone, known as the Dayton limestone. It is a compact, finely crystalline, gray limestone in layers of convenient thicknesses for building purposes. Aside from the disintegration of crystals of pyrite, common to parts of the stone, and the resultant discoloration, it is the most durable limestone in the state—the stones in the walls of the old Court House in Dayton being in excellent condition after 65 years of exposure. It also has a remarkable crushing strength. Between the West Union and Cedarville limestones, which, because of their porosity and lack of bedding planes are unsuitable for building purposes, is the Springfield limestone, all of which are highly magnesian. The Springfield limestone has a buff color, and the even layers have a range in thickness sufficiently great to meet almost any demand. Its crushing strength is ample, and it is a very durable stone, being noted for its ability to withstand both fire temperatures and the tendency to split, as most limestones do, when placed on edge as curbing. In the northern area the Niagara is mostly porous and massive and is not suitable for building purposes. The Monroe limestone covers thousands of square miles and is very thick, reaching nearly 300 feet. It is generally thin and even in its bedding, banded by organic material, and drab in color. Because of the innumerable cracks the limestone has little value as a building stone except where it is at its best at Greenfield, Highland County. This is the only place where it is being worked for that purpose or has ever been extensively so worked.

The Devonian limestones cover three districts in the state, (1) a belt stretching from Pickaway County to Kelleys Island, (2) a belt across the northwest corner and (3) outlying patches in the vicinity of Bellefontaine. The limestones have been divided into two formations, the Columbus below and the Delaware above. The Columbus has a maximum thickness of a

little more than 100 feet, and is made up of layers which range from a few inches to over six feet. The more common colors are gray and blue. The limestone in the walls of the State House at Columbus has, for nearly 65 years, successfully withstood a very trying climate. The Delaware limestone is not so thick as the Columbus, and the layers are more variable, being almost shaly in some localities and of medium thickness in others, as at Delaware and Sandusky, where it has been worked for building purposes.

Mississippi and Pennsylvania limestones suitable for building purposes are limited respectively to the Maxville and Vanport. The stone in the Court House at Zanesville, erected in 1874 from the thinner upper courses of the Maxville along Jonathan Creek, shows this part of the formation to be well suited for building purposes, although it has not been so used for years. The Vanport limestone from the Lowellville quarries has been used in a number of churches and residences in Youngstown. The limestone has a dark color, its lifeless appearance being the most objectionable feature.

The sandstones of the state suitable for building purposes are treated in the third chapter. The Mississippian rocks outcrop in a belt six to sixty miles in width which stretches from Adams and Scioto to counties on the Ohio River nearly due north across the state to Norwalk and thence east to the Pennsylvania line. In ascending order they are divided into the Bedford formation, the Berea sandstone, the Sunbury shales, the Cuyatoga formation, the Black Hand formation, the Logan formation, and the Maxville limestone. The Bedford, for the most part, consists of soft clay shales, but at some localities, as at Euclid, contains a lense of fine-grained sandstone, 15 to 25 feet in thickness. "With all its good qualities the stone is not satisfactory for building purposes, except for trimmings, sills, caps, steps, and foundations." The Berea sandstone, as well as most of the other Mississippian formations, occupies a portion of the belt already described. Its thickness ranges from a little more than one foot to over 200 feet. It is a blue-gray, coarse-grained sandstone, in which silica ( $\text{SiO}_2$ ) exceeds 90 per cent. of the whole. In most places the formation is divided into medium to thick layers by bedding planes, but much of the formation in Cuyahoga and Lorain counties is practically or quite without such planes, so that the stone has to be split in raising. The Berea sandstone has been quarried in nearly every county in which it outcrops. Approximately 30 such quarries are reviewed, about half of which are being operated, those of Lorain and Cuyahoga counties, especially, on an extensive scale. Although the stone possesses practically all of the qualities demanded of a first-class stone and has fully met the requirements after a trial of 75 or more years, and although "it is easily the leading light colored sandstone for building purposes in the United States," nevertheless the market

has not grown during the last 20 years because of the increasing popularity of brick, Indiana limestone, and Portland cement. In addition to building purposes, the other chief uses are flagging, curbing, bridge, grindstone, and breakwater—85 per cent. of the grindstones of the United States coming from the Berea of Ohio. The Cuyahoga formation ranges in thickness from 100 to more than 600 feet, and consists of sandstones, interstratified with shales. Some of the sandstones, especially those of the basal portion, are in medium even layers and are fine-grained. Laboratory crushing tests give the stone a good rating, actual usage demonstrates its durability, and the bluish-gray, and yellowish colors are pleasing. The stone from McDermott has an extensive market for building purposes, being shipped to points all the way from Maine to Missouri and from New Orleans to Alberta. The Black Hand ranges from a coarse-grained sandstone to a conglomerate in texture and in Licking and Hocking valleys has a thickness of approximately 100 feet. The rock has a number of colors, but buff is the most common. It has had an extensive use for the heavier structures, and its behavior in the walls of the Court House at Lancaster demonstrates its durability.

The Pennsylvania (and Permian) rocks cover the eastern third of the state. In addition to coal and other beds, they contain large amounts of sandstone which, for the most part, are coarse-grained and massive. In many places the sandstones are sufficiently cemented to be used for the rougher structures as foundations and bridge abutments and in some places even for complete structures. In a few places, as at Killbuck, pockets of the sandstone have, or had before exhaustion, a rich brow color—a property so important as to extend the market over much of the eastern third district of the United States.

On the whole, the report is neither so long as to discourage reading nor so short as to inadequately treat the subject in hand. It is well written and beautifully illustrated—in fact, is really inviting for a scientific treatise. The author has added materially to its

value by the introduction of short historical sketches of buildings in which the stones have withstood the relentless tests of time. The report will fill a wide-spread need for the information which is thus brought together for the first time—and, for the beauty of our cities, let us hope for an ever increasing industry.

### Paving Cutters Strike

A few days ago, 400 paving cutters representing virtually all of their craft employed in several quarries in the town of St. George, Vinalhaven, Me., quit work pending a settlement of demand for increased wages. Manufacturers say that the quarries will have to close entirely, throwing out 400 other workers unless an early settlement is reached.

### Stone for the Guggenheim Residence

About 5,000 cubic feet of American Cream White Lens limestone will be used in the new Guggenheim residence, Gray Court, at Yonkers, N. Y. The stone will be furnished by the Tompkins-Kiel Marble Company, 505 Fifth Avenue, New York. The architects of the building are Messrs. Bostwick & Leavitt, New York.



THE EAST OHIO GAS COMPANY BUILDING, CLEVELAND  
 Architect, William B. Tubby, New York. General contractors, James L. Stuart, Cleveland.  
 Cut stone contractor, John A. Rowe Cut Stone Company, Bedford, Ind. Built of  
 limestone from the quarries of the Consolidated Stone Co., Bedford, Ind.

## Modern Quarrying

**Q**UARRYING is meant the winning or obtaining of stone or mineral from the earth's crust. The quarrying of stone for construction purposes is one of the oldest industries known to man, says S. R. Russell, in a paper read before the Du Pont Sales Convention in February.

There are two general classes of quarries, first those from which stone is produced for building and ornamental use, and second those where stone is mined in broken sizes for general commercial purposes. The former class is the older and originally the industry was confined to building stone operations.

The architectural beauty and strength of design of the famous temples and mosques of the ancients are still the marvel of and example for present day build-

poorer grades of material. Occasionally in slate and sandstone quarries the well drill method is followed, holes being loaded with "A" blasting or other low explosives and the material thrown out in huge blocks after which it is sawed and cut by machines to the desired sizes.

On the other hand, there is a vast quantity of explosives used in quarries of the second class, that is, crushed stone quarries, and the consumption is increasing annually.

There has been a wonderful development in quarries of this class in recent years. A few years ago a plant producing five or six hundred tons of stone per day was considered of good size. Now it is not uncommon to see plants turning out from 4,000 to 10,000 tons per day. As the demand for stone has increased engineers have been spurred on to meet it, and as a result we have the mammoth crushers, well drills, steam shovels and modern conveying machinery which have entirely revolutionized the quarry industry.

It is not our purpose to go into the engineering problems involved in laying out quarries, crushing plants, etc., but we are interested only in that phase of the subject on which the use and application of explosives have a direct bearing. It is necessary for us, however, besides knowing the explosives we sell to have a fundamental knowledge at least of crushing machinery, various types of drills and methods of drilling, handling and conveying methods so that we can be of most service to our customers. A knowledge of these things greatly assists in a wise selection of the proper explosive for a particular operation.

In selecting an explosive for best results in quarries there are many conditions which must be considered and which have an important relation to the question.

Among the things necessary to know are:

Kind of quarry. Pit—hillside or cliff. Nature of the material—limestone, granite, trap, sandstone, etc. Direction of the strata—flat, pitching, vertical or irregular.

Thickness of the ledges.

Purpose for which the stone is used. Whether flux, lime burning, rip rap or crushed for commercial purposes.

Method of drilling—tripod or well drill.

Method of loading stone—hand or steam shovel.

Height of face or benches.

Size of crusher and whether the work is wet or dry.

We have used the terms "pit," "hillside" and "cliff" to denote the following:

A pit quarry is located in a flat country where the face is obtained by sinking to any desired depth.

A hillside quarry is one where a face is obtained by exposing a natural rise in the surface.

A cliff quarry is one where the face is on a very high

### STONE FOR A BIG BREAKWATER

Granite cut by the Rockport Granite Company, ready for delivery to the Sandy Bay breakwater under construction off Rockport, Mass

ers. From the descriptions of some of these, one cannot help but think that we in spite of all our modern inventions have little to boast of in this line.

Quarrying in the United States dates back to about the time of the Revolution and stone was first systematically quarried in New England about 1700. True some stone churches and buildings were erected previous to this, but they were constructed with boulders. Slate was first quarried to any extent for building purposes in 1825.

While a considerable quantity of explosives is used in the granite, slate and marble quarries, since the development of channeling and other machines the consumption is steadily diminishing. In quarrying marble and other fine stones some believe it best to avoid the use of explosives because their use is thought to cause deterioration of these finer stones after a time. Usually these stones are cut in blocks with channeling machines and a series of horizontal holes, called gadding holes, drilled in the bottom in which wedges or light charges of powder are used and the block sprung from its bed. Explosives do not seem to injure the granites and are used more freely in such quarries. In many of the large Vermont quarries quite a lot of explosives are used but mainly to remove spoil or

hill or mountain side and does not permit of any systematic method of working.

It must be remembered that the explosive cost is only one item, although an important one, and often neglected in the production of stone. There is a limit to the useful work which any explosive can do and in order to get the most out of it, the drilling must be properly done, holes rightly spaced and the manner of handling and storing be according to the best approved methods.

Probably the most common stone that is quarried is limestone. There are many varieties of this ranging from the high calcium or dolomitic kind used for fluxing, lime and cement manufacturing, down to the poorer and harder variety used for general commercial purposes.

The limestones of the Middle Western or Prairie States consist mainly of the dolomitic kind and lie in flat, laminated layers.

In the Eastern and far Western States we have all kinds of limestones and an abundance of gneisses, traps, granites and the harder diabase rocks. The rocks in these sections are found more massive, harder and the strata irregular. This is due to the fact that these rocks are of an older age and have been formed by the twisting and warping of the earth's crust in the process of mountain making.

### A Standard Barrel of Lime

Representative Hay has introduced a bill in Congress to standardize the barrel of lime. The bill establishes a large and small barrel of lime, the large barrel to consist of 280 lbs. and the small barrel to consist of 180 lbs. net weight. It also provides that the net contents shall be stenciled on one or both heads of the barrel. A further provision is made that when a jobber or local dealer sells lime in quantities of more than one barrel and delivers it in barrels which are not headed and are used merely as containers, then nothing in the act shall be deemed to require that the barrels be marked as provided in this section or that each individual barrel contain either of the standard weights established, but he shall nevertheless deliver a total weight equivalent to the total weight of the large or small barrels represented sold or charged for by him or purported to be delivered by him pursuant to an order.

### Fire Losses in the Stone Centers

It is apparent that Barre as a municipality has not done what it should to protect all its manufacturing plants from fire, says the *Times* of that city. This failure to give adequate protection has not been due to wilful neglect. It has been due to lack of knowledge of the real conditions of the water pressure in some sections of the city which are served by branches of the water system. For instance, no one knew that a hydrant near Barclay Brothers' plant on Batchelder's

meadow would not throw three streams of water to the eaves of the low structure, or even across a three-rod street. No one had any idea that granite plants in the north end of the city were not adequately protected as far as water pressure was concerned. We have been accustomed to watch the powerful streams of water shooting to the tops of the highest buildings on Main Street, and to consider that similar conditions would obtain were the fire located on Batchelder's meadow, the Smith meadow or in the extreme end of the city limits, where the great plant of Jones Brothers Company is located. But through the agency of the test made by the Boston Insurance Exchange, at the

GRANITE QUARRY AT BAYVIEW, MASS.  
A portion of the immense pit of the Blood Ledge Quarry of the Rockport Granite Company

instance of the granite manufacturers who were seeking reduction of high rates of insurance, it came out recently while fire department, water department, aldermen and granite manufacturers were astounded spectators. With fairly adequate equipment, with alert firemen and even with plenty of hydrants it would not have been possible to stay the progress of the flams in those sections once a fire had secured a good start. One stream of water cannot stop a conflagration, and one stream, and that extremely weak, was all that could be produced.

To remove that state of inefficiency is, therefore, the first duty of the municipality. The duty goes ahead

of every other consideration except the conduct of municipal affairs along the regular channels. We must protect the granite plants, which are the life of the community. Adequate protection will not be supplied until the present small branch water mains are replaced by pipes that are double the size now in the ground. Be it said to the credit of the city council that tentative plans were already under consideration for improving conditions in some sections of the city. Those plans will have to be amplified to meet the needs which have been revealed at this time, and the plans should be developed along lines prepared by careful calculation and thorough understanding. Let this work take para-

mount position in the minds of the city council and let it be prosecuted to satisfactory culmination even though some other projected plans have to be set aside for the time being. The granite plants must be given adequate protection.

### A Lincoln Memorial for Syracuse

The city of Syracuse is planning the erection of a Lincoln memorial, either in Lincoln Park or in the downtown section of the city. A shaft was suggested at first, but the proposition is now made to erect a building to take the form either of a museum, observatory or a shelter.

## The Trouble with the Slate Trade

**A**CCORDING to figures compiled by the United States Geological Survey, and just published, the total value of all kinds of slate sold in the United States the past year had a value of slightly less than \$5,000,000. Compared with the production for 1914, this was a decrease of 13 per cent. The production of black-board material and school slates showed a falling off of more than 30 per cent. over the previous year. It might readily be supposed that this decrease was due to conditions brought about by the great European War, and in that case would be entitled to comparatively little attention. But anyone who studies the slate industry will realize that it is the one branch of the entire stone trade that has shown scarcely any growth during the past ten or fifteen years.

Until 1887 the total production of slate was less than \$2,000,000 in value. Then it began to show occasional slight advances, followed by decreases, so that there was no steady, even if slight progress. The greatest value that the slate production of this country ever attained was slightly over \$6,250,000. And for the past few years it has not been able to keep up even to this figure. During this same time, the general stone trade has made marvelous advances, the production more than doubling in value until it now exceeds \$80,000,000. Of course, this is a reflection of the general growth in wealth and population of the country and it would seem as if the slate trade should be in almost as prosperous a condition. The trouble is that the slate men as a rule have shown a disheartening lack of enterprise and have apparently made little effort to realize the full possibilities of their material.

The general consensus of opinion is that slate is the best of our roofing materials, from the fact that it is fireproof, that it shows no deterioration from moisture or atmospheric acids and that it requires no expenditure for repairs and up-keep. But no effort has been made to keep these facts before the building public. The manufacturers of the various forms of artificial roofing

are energetic and enterprising advertisers. They spend hundreds of thousands of dollars every year in pushing their wares even if they do occasionally make claims that can scarcely be justified by experience. It may be doubted if there is a single industry in this country with as much capital invested and as large an output as the slate quarries that does as little advertising or that makes as little intelligent effort to promote business as the slate trade. How can producers expect the support of the general public when it is constantly being told in the most forcible manner what are claimed to be the manifold superiority of various patented roofings?

There is another reason that is partially responsible for the lack of growth in the slate industry. This is the unwillingness to adopt modern methods of quarrying and manufacturing. The tremendous proportion of waste in the slate field has always been a great drawback, but it is believed by careful men, who have studied the subject, that this could be reduced sensibly if the producers and manufacturers would show the same willingness as other trades to profit by the lessons of the past. There should be greater care in the opening of quarries to profit by the natural conformation of the deposit. Improved machinery for the extraction of the stone would do something. Above all, there should be an effort to utilize more of the stone that is quarried. A large proportion of the quarries produce roofing slate only and any block that is not suitable for splitting into roofing slate is at once thrown on the dump. That means that a stone from which the sap has dried out is rejected, although it has been conclusively proven that slate quarried for several years can be split by mechanical means into the very thinnest plates. The slate manufacturers simply will not listen to any talk of the splitting of slate by mechanical means, simply because they and their forbears have always split by hand. Some of them have witnessed demonstrations of the process and have seen that it will do all that is claimed for it. Nevertheless they re-

main unconvinced and will not even figure on the cost of installation and operation. In the same way, they will not consider the mining of slate, even when the natural conditions all favor that method. Instead of running a shaft to the bottom of the vein, or as near it as possible, and then working up, as is done in the largest and most successful slate quarries of France, the American operators will persist in removing thousands of yards of top at a tremendous expense. The advantage of the French system is that the waste can be left where it falls to make a new floor and does not have to be handled at all. Plenty of slate rock that is not suitable for roofing is also thrown on the dump, whereas it would be admirably fitted for milling.

It must not be thought that this condition of affairs is one that obtains in the United States only. Much the same complaint is constantly made in Great Britain. In the slate quarrying district of Wales, an acute depression has existed for the past ten years and this has naturally been intensified by war conditions when much of the building that would have used slate, has been stopped in favor of temporary building for which presumably cheaper forms of roofing have been preferred. The Urban District Council of Partmadoc, from which much of the Welsh slate is shipped, in order to make an effort to combat this depression, decided to call a conference the last of April of representatives of various public bodies, quarry owners, workmen, railroad companies, the press, and ship owners connected with or interested in the slate industry, together with members of the Parliament for the quarry districts. It is intended to provide a permanent committee to consider and take such steps as appear practical along the following lines: (a) To cultivate a public opinion in favor of slate, through the media of trade journals and newspapers. (b) To secure business in connection with town planning and other building schemes by public authorities. (c) To develop foreign and colonial trade. (d) To promote the demand for slate by meeting aesthetic requirements, and in this connection it is suggested:— (1) That slate in forms other than rectangular be freely manufactured. (2) That different systems and patterns of roofing be promoted. (3) That artistic color combination be arranged. (4) That roof forms be specially designed to suit slates.

This is certainly a movement in the right direction and should be an inspiration and suggestion for the slate quarrymen and dealers in this country.

### **Nova Scotia Limestone Industry**

The Nova Scotia Steel Co., one of the owners and operators of the Bell Island hematite iron ore deposits, does not confine its Newfoundland activities to Conception Bay, according to recent consular reports. It draws limestone for use in smelting from Port au Port, south of Bay of Islands. These quarries are close to the sea, favoring the simplest arrangements

for the speedy loading of the vessels that carry the limestone to the Canadian plants of the company.

Operation of the Port au Port quarries was suspended throughout 1915, partly because of uncertainty in the early period of the war. This suspension has been one of the few direct and unfavorable effects of the war on the west coast of Newfoundland. Though the company's Port au Port activities are not great, the loss of a pay roll of \$75,000 per annum is relatively important to such an undeveloped region as this.

Work at the Port au Port quarries could be suspended in 1915 because the company had on hand in Canada a considerable reserve of limestone. The year 1915 proved a most profitable one for the company, and the demand for iron products, in part incidental to the war, indicates that the plants will be run to capacity in 1916. These conditions make it likely that the Port au Port quarries will be worked this year. The Nova Scotia Steel Co., in common with others, is however, somewhat handicapped by the shortage of ship tonnage arising from the war, and this condition may curtail the production at Port au Port.

Other concerns obtain limestone from the west coast. The pulp and paper mills near Grand Falls, Newfoundland, need limestone for their processes, and this supply is quarried on the Humber River near Bay of Islands. Several thousand tons were shipped in 1915. It is likely that fully as much limestone from Bay of Islands will be needed in 1916.

The Bay of Islands limestone quarries are a factor in the plans of those projecting the Newfoundland Products Company. The legislature, at its 1915 sitting, granted to the promoters of this company extensive rights, of which the most important, perhaps, is a monopoly of the water power of the Humber River and of a river on the Labrador coast. The potential power of the former is said to be about 120,000 and of the latter 86,000 horsepower. To secure its concessions in water-power rights, eminent domain, freedom from taxation and custom duties, etc., the company must establish an industrial plant requiring an investment of \$16,000,000, of which about one-third must be expended within 10 years.

### **Contract Awarded for Stone for the New Kahn Residence on Long Island**

The interior of the Kahn residence on Long Island will be finished in the Littleton Golden Stone, a sandstone quarried in West Virginia and furnished by the Tompkins-Kiel Marble Company, 505 Fifth Avenue, New York City. About 6,000 cubic feet of stone will be required. The exterior will be built entirely of Indiana limestone from the quarries of the Consolidated Stone Company, Bedford, Ind. The cut stone will be executed by Jas. Gillies & Sons, Long Island City. The architects of the residence are Messrs. Delano & Aldrich, New York.



## Relation of Sculpture to Architecture

**I**T is only in comparatively recent years that we in America have any extended use of sculpture in architecture. Even during the period when we were tempted to too great a profusion of ornamentation, this took the form of mouldings and carvings, and not of sculpture proper. For thousands of years churches, and even pagan temples, in the old world, made statuary the principal part of the exterior ornamentation. Perhaps it was the Puritan influence that prevented this custom from gaining headway in this country. To this day there is less architectural sculpture in our churches than in many other classes of buildings. But there has certainly been a constant and larger demand during the past few decades for sculpture as an adjunct to architecture. Not only are statues to be found on many of our important public buildings, in New York, for instance, on the Custom House, the Appellate Court and the Hall of Records, but they are also given a place on great business buildings, banks, exchanges, mercantile houses and the like. A large proportion of the work is distinctly good, and some of it is of the highest artistic excellence. It has done much to dignify our architecture and to develop public taste.

A very admirable and suggestive discussion of the relation of sculpture to architecture is given in *The Architect and Contract Reporter*, of London.

"One of the most satisfactory indications of vitality in our modern architecture is the increasing frequency of employment of sculpture as a component of the design of our buildings, even in those that are regulated in their cost of construction by the necessity of paying a dividend," says the writer. "At the present day it is not merely our public buildings, our palaces, our churches, our museums that we see adorned by sculpture, but our office buildings and other commercial structures, the architects of which do not hesitate to add by the cost of sculpture to the ground rent and capital expenditure on which a return has to be obtained. In the ultimate consideration this means that the public, who pay the rents, are willing to pay the necessarily higher rent that is required to defray the cost and yield a percentage of profit on the increased expenditure.

"We are still, however, in this country, in the unfortunate position that the sculpture and the architecture of our buildings are, too often, not closely co-ordinated and integral components of the design, but stand in the relation of distinct entities, of which the one is applied to the other as decoration or ornament. We are still far from attaining the level of Pheidias and the French figure carvers of the thirteenth century, whose sculpture was as essentially part of the buildings on which it appeared as the mouldings and purely architectural forms.

"The reason for our present failure to attain this

level is, undoubtedly, due to the divorce between architecture and sculpture which has come about, so that they are regarded and practised as separate arts, rather than branches of one art. It is, possibly, vain to hope that we may revert to the conditions of artistic life in Greece, in thirteenth-century France, in Italy of the Renaissance era, when sculptor and architect were one and the same individual. Our only hope now lies in a more intimate association in their early training, as in their mature life, of art students who specialize in one or other branches, and in a more extended study of art in all its forms by every student and practitioner. No longer must architecture, sculpture, and painting be locked up in water-tight compartments, but some knowledge of all must be imparted to and acquired by the workers in each.

"Every embryo architect should be trained to understand the language of sculpture and of painting, although he may not be able to express himself with freedom and facility in their peculiar idiom. So, too, the sculptor should learn so much of architecture as may enable him to execute his own work in consonance and harmony with the building of which his productions will form a part.

"The effect of a building or a monument upon the beholder—and we are speaking now of the Philistine, of the man who does not understand or comprehend the technique of the art upon which he looks—depends primarily upon the harmony of its constituent parts. Just as there are thousands who, without any skilled knowledge of music, receive in their enjoyment of a well-composed and well-played piece a shock from an accidental error of the executant or an unresolved ninth of the composer, so the ordinary layman, in his contemplation of a building, will, without comprehending the reason, experience a feeling of uneasiness when architecture and sculpture are discordant.

"We, who are practitioners of art, in our criticism of work before us, whether silent or expressed, are prone to analyse the technical faults, whether of design or execution, of that which displeases us, so that we are apt to ignore the standpoint of those who cannot follow us in our perception of technical deficiencies and to assume the incompetence of the Philistine, who can give no other reason for his pleasure or displeasure than 'I know what I like.' But if there is any reality in art expression at all it must affect the unlearned as well as the cognoscenti. Hence, if plastic forms are in future to be allowed, by those who pay, as part of the detail of buildings, it is of vital importance that architecture and sculpture should be harmonious.

"Although it may, at first sight, appear that there is a difference in essence between the sculpture of those structures of which it is the predominant part, as in what we ordinarily call monuments, and that which

forms the decoration or ornament of a building, yet in each class it is equally important that both architecture and sculpture should speak in the same key. On the one hand, the dominant sculptural forms should not be considered all-important, and the architectural details of the pedestal or other support a matter of complete indifference; and, on the other hand, a building should not be regarded as a mere frame of which certain spaces are to be occupied by sculpture that may take any form that its creator pleases so long as it adequately fills the space allotted to it.

"There may well be some difference in the treatment of sculpture which forms, as it were, an integral part of a building, as, for example, a keystone, a seandril, or a panel in a wall surface, and that which may be regarded as applied decoration, such as crowning figures upon a sky-line or detached groups of figures, supported by structural features or with the architecture as a background.

"It is perhaps in the use of sculpture as what we have termed applied decoration that dissonance with the associated architecture is most prevalent. The sculptor seems to feel that he is more free to do as he pleases when his work is no longer rigidly framed by the lines of architectural forms, but, in a sense, is detached and stands alone. The most glaring defect that is apt to develop is want of scale. The plastic forms are often too large or too small for their supporting architectural features, most usually the latter. Giant orders are crowned by exiguous single figures, whose actual as well as expressive burden is a mere feather-weight compared to the structural load which similar components of the architecture support.

"We venture to think that it is at least questionable whether a single figure should ever be the crowning load of a single column with its entablature. The lines of the column dictate the extreme breadth of the figure and its accessories, whilst the lines of the entablature connecting with the walls of the building emphasize and to some extent exaggerate the supporting power. Hence, too frequently, the load is disproportionate to the support. This view is in no way at variance with the use of a columnar form as a support to a figure in an isolated monument, in all the successful examples of which the entablature is absent.

"The other faults to which sculpture as applied decoration is most liable are incongruity of expression, as between delicacy and force, and harsh clashing of line. The latter is especially probable if the sculpture is far detached from the main structure, so that other parts besides those immediately connected are conjoined in the view. The finest examples of harmony of line between sculpture and architecture that the world has seen are probably to be found in the thirteenth-century cathedrals of France, and these should be the subject of study by every sculptor who purposes the exercise of his craft in connection with architecture."

### Building Activity in San Diego

The newspapers of San Diego, Cal., declare that there is a great deal of building activity in that city and that the number of building permits to date this year are considerably in advance of a same period last year. In addition to this, construction work amounting to nearly one-half million dollars, for which permits have not yet been obtained, is now on the draughting tables in the offices of local engineers and architects.

### Building Activity in Brooklyn

During the first half of April plans were approved in Brooklyn for 265 new buildings to cost \$1,734,900, as compared with 332 new structures to cost \$2,549,455 for the corresponding period for last year. In spite of this falling off for April, the three and a half months of 1916 show a substantial gain over the corresponding period of 1915. During this time, 2,700 plans have been filed from January 1st.

### Louisiana Limestone

At a recent meeting the Louisiana section of the American Chemical Society discussed the opportunities for the development of resources natural to the state. It was announced that there is now under way at Shreveport a plant for the manufacture of lime, which will provide a cheaper product for all Louisiana.

### Decrease in Slate Production

The total value of slate of all kinds sold in the United States in 1915 was \$4,958,515, according to the United States Geological Survey. This was a decrease of 13 per cent. compared with 1914. The sales of roofing slate in 1915 were 967,780 squares, valued at \$3,745,934, and of mill stock 4,576,112 square feet, valued at \$819,672. Blackboard material and school slates decreased nearly 31 per cent.

Several producers have reported to G. F. Loughlin, of the Geological Survey, that during the last three months of the year conditions began to improve and that early in 1916 prices for slate of all kinds were more encouraging than at corresponding times for several years. At present many of the quarries can greatly increase their output to keep pace with any increase in demand.

The producing States in 1915 were the same as in 1914 and maintained the same rank. In Maryland and New York there were substantial increases in the value of the slate sold, and in Virginia a small increase; in the other States—Maine, New Jersey, Pennsylvania and Vermont—there were decreases.

The total number of operators, which had decreased from 171 in 1913 to 157 in 1914, continued to decrease in 1915 to 148. Virginia was the only State in which the number increased—from 7 to 8. Of the States

producing roofing slate, Maryland gained not only in quantity and value but in price per square of slate sold; New York and Virginia also gained in quantity and value, but the price per square decreased in each State. Pennsylvania and Vermont, which together yielded more than 86 per cent. of the total value of roofing slate, decreased in quantity, value and price per square. Only Maine, Pennsylvania and Vermont reported sales of mill stock in 1915, and in all these States both quantity and value decreased.

The value of slate exports, which was \$226,413 in 1913 and \$139,125 in 1914, was only \$46,137 in 1915, the lowest recorded since 1895. England, which has heretofore been the largest user of American slates, did not import any in 1915; neither did Belgium, Denmark, Germany or the Netherlands. The failure of the United States to export a considerable amount

under these conditions indicates a world-wide decline in building operations during 1915.

Next to the United States, Great Britain and France are the chief slate-producing countries, and Belgium ranks fourth. Other countries reporting an output of slate are India, Germany (Bavaria) and Canada. As all these countries were directly or indirectly involved in the European war during 1915, both their production of slate and their demand for slate doubtless greatly decreased. Canada's production, according to John McLeish, of the Canada Department of Mines, decreased from 1,075 squares, valued at \$4,837, in 1914, to 397 squares, valued at \$2,039, in 1915.

Imports of slate into the United States have for many years been insignificant. In 1914 and 1915 the total values of imported slate were respectively \$4,855 and \$2,768.

## Quarrying on the Ocean Bed



AS long as men have used steel tools there has been the need for grindstones and whetstones to give them an edge. This accounts for the fact that the quarrying and manufacture of these stones was one of the earliest branches of the stone business to be developed in this country. It is an industry, however, that is narrowly confined to the few localities where suitable deposits of sandstone are to be found. There are several centers in the United States where great industries have been built up. In addition to these, however, Canada has taken an important part in the production of grindstones and whetstones, for the reason that the sandstones of New Brunswick and Nova Scotia have been found particularly adaptable to this use. There is one fact that has made the production of Canadian grindstones among the most interesting of all quarrying operations in the world. The ledges of stone that are utilized for this purpose are on the coast line and extend out into the ocean. Much of the stone is actually extracted beneath the sea level.

One of the most important centers of the Canadian grindstone industry is at Stonehaven, Gloucester county, New Brunswick. Here are located the quarries of the Read Stone Company, which have been operated for sixty years. An account of the method of extracting the stone is given in a local newspaper. The quarries are unique in this fact, the areas worked have been in turn reclaimed from the sea by the building of dams. This has been no small undertaking. The dam around the present quarry which has just been finished, is over one-quarter of a mile long, and in all about a mile of dams has been built here. Anyone who has seen the Bay Chaleur in a storm will know that these dams are no flimsy affairs. They have been built chiefly of

timber cribwork filled with stone and heavily ripped on the side exposed to the sea. The dams have been made water tight by the use of a clay puddle pounded tight.

After the dam is built the water is pumped out and quarrying operations start. The stone lies in horizontal sheets of varying thicknesses, the total depth of rock being about 25 feet. A steam channeller, steam and air drills are used as required and by the use of these and with powder and wedges the rock is quarried to the required size. It is then hoisted to the "dump" where the stonecutters take it and shape it round. From there, if it is not too thick for a single grindstone, it goes direct to the lathe to be finished. If the block is say two or three feet thick it is sent to the saws and cut to the required thickness. This applies to the larger stones, say 48 inches in diameter and larger. The smaller stones are split out of the irregular shaped pieces that come out along with the larger stones. The stones are cut round and shaped as a rough grindstone. In the olden days the grindstones were finished by hand by means of chisel and mallet. Now the rough grindstone is taken to the mill where the eye is drilled and the stone turned on a lathe in a very short time. Indeed an expert turner will finish a small stone in five minutes. Many of the small grindstones, particularly the thinner ones, are made by sawing large blocks of stone into thin slabs, say 1½ to 2 inches thick. These slabs are then cut up into required sizes and the grindstone is finished on the lathe direct from the square slab.

The quarry is well equipped for handling stones. Three derricks are used at the quarry, two at the mill with a third in course of erection, and three at the wharf and station, while a traveling derrick operating

under its own power and equipped with an orange peel bucket has been used for stripping purposes. One steam plant of 50 H. P. operates the hoisting machinery for the quarry derricks. Another of about the same capacity handles the pumping plant and the steam channeller. A 100 H. P. plant runs the mill machinery. This consists of an air compressor for the hammer drills used in the quarry, three gang saws, eight lathes, two scythe stone grinders, shingle mill for making shooks for scythe stone boxes, besides the necessary hoisting and pumping machinery, exhaust fans, etc. Water for the boilers is piped from a reservoir half a mile away.

The making of scythe stones is an interesting side line at this quarry. The block of stone is first sawed into slabs 1½ inches thick. These slabs are then broken under a special knife to pieces say 10 inches by 1½ inches by 1 inch. These pieces are then held under a weight to the surface of a revolving grinding bed. Sand and water are pumped on this bed and the stones are ground to a smooth surface.

In the early days at Stonehaven, the grindstones were quarried on the reefs at low tide, floated or hauled ashore, and finished by hand. These were perhaps the picturesque days of the industry, when men worked often to the waist in water, by day and by night as the tide suited. Stormy weather meant a partial stopping of the work. Shipments were made by scowling the stone out to schooners in the offing. At this time probably 300 men were employed. Later came machinery, and better shipping facilities, and now about 100 men are employed during the summer. Quarrying starts in May and ends in October. It is impossible to work when there is danger of the frost cracking the freshly quarried stone.

The grindstone industry of Canada had its beginning at the head of the Bay of Fundy, near Minudie, N. S., probably by the French, for local use, before the British occupation. Afterwards a British officer of distinction, Joseph Frederick Walleth DesBarres, later Governor of Prince Edyard Island, secured a grant from the Crown, of Minudie and adjacent country, many miles in extent and including the grindstone ledges at "The Joggins" as that part of the Bay shore was then called.

DesBarres later leased these ledges to his farmer tenants of Minudie, both French and English, who made grindstones by hand in a co-operative way. About 1815 Joseph Read and John Seaman, who came from Sackville, N. B., about 1808, leased farms from DesBarres' agent, acquired control of these ledges as shown by an old lease from the proprietors, and began regular shipments of grindstones to the United States in small vessels. The grindstone business has practically been in the hands of the Read and Seaman families ever since.

The business grew rapidly and was extended to other

locations on the Bay of Fundy, both in Nova Scotia and in New Brunswick, the great tides of this bay baring the ledges of rock twice daily, allowing the rock to be excavated when the tide was low. With the rising tide boats were fastened over the loosened rock and large blocks were floated to high water level in convenient coves where, after the tide had fallen enough, workmen shaped the stones by hand into the grindstones of commerce. When a sufficient quantity had accumulated at any one place a vessel would come for them, grounding in a prepared berth near the grindstones (there were no wharves) and they would be hoisted on board by the quarrymen, no light task as many of these stones weighed over three tons. Later oxen and horses were used for hoisting.

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### Building Work in Many Cities

The volume of building permits taken out during April indicates that considerable activity prevails generally and that conditions, as a whole, are satisfactory. Returns received by *Dun's Review* from eighty-three leading cities in the United States indicate that permits were granted last month calling for the expenditure of \$76,927,860, a gain, as compared with the \$66,930,612 of the same period last year, of 14.9 per cent., and of 11.8 per cent. over the corresponding month in 1914.

The total at New York City shows a sharp contraction, that centre reporting \$14,710,049, as against \$16,324,257, a loss of 9.9 per cent. There is a good gain in the Borough of Manhattan, \$7,028,700, comparing with \$5,834,740, but this improvement is far more than offset by the decreases appearing in the Bronx and Brooklyn, the former reporting the value of projected new building in April to be only \$1,813,390, against \$2,917,300 last year, and the latter \$3,332,870, against \$4,808,365. A moderate falling off is also shown by Queens and Richmond.

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### Memorial Fountain Designed by Women

The Sydney Smith Memorial Fountain will be erected in Fair Park at Dallas, Tex. Captain Sydney Smith was for many years secretary of the Fair Association, and it is hoped to have the dedication of the fountain on the opening day of the State Fair this year. The leading figure of the memorial is a large bronze statue. It was modeled by a Dallas girl, Miss Clyde G. Chandler.

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### Beginning the Nave of St. John's Cathedral

During the past month ground was broken for the nave of the Cathedral of St. John the Divine, on Cathedral Heights, New York. It is expected that the work will be carried along steadily, although it will be several years in construction. It is the largest stone job now in sight.

# STONE

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MAY, 1916

No. 5

It will be remembered that the city of Paris, Texas, was swept by fire a couple of months ago and that property valued at almost \$10,000,000 was destroyed. It is interesting to learn that shingle roofs are blamed for the spread of the fire. The city council has passed an ordinance requiring the use of non-combustible roofing material in the re-building of the city. Even if this is a case of "shutting the door after the horse is stolen," it is certainly a move in the right direction. The use of slate, which is Nature's choicest material for roofing purposes, is not only more economical, inasmuch as it does not require repairing or painting, but its general use throughout the country would save millions of dollars in fire losses. Aside from the danger of fire from the use of shingles, their life under the best of conditions is so short that there is no economy in their use.

DURING the past month visitors to the office of this magazine have included men who have been, within the past few weeks, at nearly all of the leading stone working centers of the country. It is interesting to record that almost without exception these people have taken a very hopeful view of the present condition and future prospects of the stone industry. They declare that while few of the plants may be working to their full capacity, most of them have plenty of work on hand and much more in prospect. One drawback is the difficulty of moving stone owing to the fact that the railroads have been so rushed with freight for exportation. The transportation companies, however, are fast adapting themselves to the new conditions. Labor troubles also interfered somewhat with the signing of contracts, but these have generally been adjusted on a basis that seems fair to both sides. Building is always slow to recover after a period of depression but the tremendous activity that is ruling in almost every line

of industry cannot but mean a marvelous increase in building before long. The present year may not show the greatest stone output in the history of the country, but we are very rapidly moving toward the hundred million dollar mark.

For a year or two past, there have been a surprising number of fires among the stone sheds of Barre, Vt. The direct loss from the destruction of buildings, machinery and granite in process of manufacture has amounted to hundreds of thousands of dollars while the indirect loss from the interruption of work has been fully as much more. One result of this has been that the insurance companies have been steadily increasing their rates until the securing of fire protection has become a very serious tax. Much the same condition of affairs is to be noted in other stone working centres. The Barre manufacturers have finally awakened to the seriousness of the situation. Recent tests have shown that the water supply in certain sections of Barre where the large plants are situated is totally inadequate to cope with a fire that has gained much headway. Naturally, they demand that the city shall provide suitable protection. Stone working plants contribute much to the wealth of the communities in which they are located. Owing to the nature of the business, many of these plants are located in the outskirts of the cities and towns where the water mains are of small capacity. Owners should see to it that citizens are awakened to the necessity of providing a plentiful water supply because without this the best drilled and most capable fire department counts for nothing. There is nothing in the stone working business that should make the plants extra hazardous as fire risks and yet the insurance rates are surprisingly high.

## The Stone Industry in Sweden

AN ARTICLE in a commercial paper of Stockholm says that the stone working industries in Sweden have suffered ever since the beginning of the war, owing to the reduction of exports to Germany and that there is a general slackening of activity in the building trade. At the time the article was written, the British embargo on the importation of stone and other materials into Great Britain had probably not gone into effect.

Without any definite figures at hand, we are inclined to believe that Great Britain was almost as good a customer of the Swedish Granite quarries as Germany. This was due to several causes. In the first place, the Swedish granites are diversified in color and there is a plentiful supply of several colors more desirable for monumental work that are found only to a limited extent in the British Isles. In the second place, the Scotch quarries, from which most of the supplies are drawn, have been worked for so many years that the quarry pits are all of great depth, making the extraction of the stone fairly expensive. In the third place,

freight rates for stone on the British railroads are very high, whereas most of the Swedish quarries are situated on the seaboard and the product can be shipped by vessel direct to any seaport in Great Britain at an extremely low rate.

There are a number of varieties of granite very popular in Great Britain that are obtained from Sweden, although most of the purchasers doubtless believe they are a home product. The embargo laid on stone by the British Government was due to the scarcity of bottoms and the difficulty of obtaining sufficient tonnage to transport indispensable supplies.

### Flint Pebbles from France

The flint-pebble industry is confined almost wholly to the French coast lying between Havre and Dieppe. The pebbles collected in and near Havre are selected for their spherical shape and are used exclusively for pulverizing in certain industries, particularly in the manufacture of cement, and in copper mines, being employed in the interior of large cylinders, writes Consul John Ball Osborne from Havre. In the cement industry the slow turning of the pebbles produces a powder which becomes an ingredient of the cement, while in the copper industry the metal is freed of all impurities by the grinding operation. The same kind of pebbles is used for crushing purposes in the manufacture of paint.

Another important use of flint pebbles is in the manufacture of porcelain; but for this purpose a pebble of purer flint is used than those found at Havre. The porcelain flint is found on the French coast in the region between Fécamp and Calais. These flint pebbles need not be spherical, since they are utilized by being crushed into a powder, which becomes an ingredient of the paste used in the manufacture of porcelain. To some extent, however, the round pebbles found at Havre are used for pulverizing in the porcelain industry.

The flint pebbles are gathered by women and children. Prior to the war the price to pickers was 15 francs (\$2.89) per ton for the best flint pebbles, and 5 francs (\$0.96) for ordinary flint pebbles. Besides the shipment of these pebbles to the United States for use in the industries above mentioned, large quantities are regularly shipped from Fécamp and St. Valéry-en-Caux to Liverpool for use in the Staffordshire potteries.

A leading shipper reports that the quantity shipped to the United States in 1915 was about 25 per cent. less than in the preceding year. He attributes this decrease to several reasons, including the scarcity of male labor, the lack of transportation facilities, and the congestion of the port of Havre, which did not permit the usual temporary storage on the quays of the bags of pebbles intended for exportation. The same dealer states that the cost of labor and transportation by teams and the

prices of the bagging used as covering have all steadily risen, thereby necessitating an increase in the prices of the pebbles over those of the preceding year without any corresponding profit to the exporters. He adds that flint pebbles are in much demand for consumption in the United States as a result of the heavy exports to foreign countries of those American products in industries which use the pebbles as raw material.

### Details in Proposed Building Work

A question of moment which affords a quandary for the building contractor of today, is that of how soonest and most effectually to induce architects to furnish full detailed information with regard to a job on which bids from the contractors have been invited, without which information the bidder is venturing in the dark, since the matter of detail is usually, the determiner, in building contracts, of profit or loss, says a Pacific Coast exchange.

The matter was given considerable attention during the agitation of the proposed universal adoption of a standard form of documents, and various forms of remedial measures were proposed. G. Alexander Wright, of San Francisco, recommends in a recent writing, as one of the remedies, the passage of a city ordinance providing that applications for building permits, for work above a certain estimated cost, should be accompanied, not only by the usual plans and specifications, but by details to a scale of not less than one and one-half inch to the foot, or sufficient to indicate the character of the work which will be required to be done in detail.

Another remedy, it is urged, is the quantity system; but since this has not as yet been generally adopted, notwithstanding the fact that it is the most modern method of inviting bids, another remedy, immediately applicable and effectual, must be sought, found and applied.

There can be no gainsaying the fact that in order to bid intelligently and safely on a contract, the contractor must have the details of the job. Otherwise, in the absence of such, he must, in simple self protection, as Mr. Wright has pointed out, raise his bid high enough to cover possible contingencies, in which case the owner usually is the sufferer. The details can be studied and delineated just as easily, and in the same amount of time, before the bids are called for as after they are submitted, and as they must be furnished to the contractor at some time, there can be no reason at all advanced why they should not be given out in advance, thereby enabling the contractor to make up his bid intelligently, to know just where he "is at" in his bidding.

As Mr. Wright has said in his able discourse on the subject, the individual contractor can not force the issue alone. Certain it is, however, that if the contractors will "get together" in thorough co-operation, through organizations such as the Contractors' and

Dealers' Exchange, and, collectively, put the facts of the case squarely up to the architects, a measure of betterment of conditions is certain to result.

### A New Stone Drill

A new portable hammer for use in drilling holes in stone or brick has recently been devised which uses a magnetic clutch to obtain the striking action. The apparatus consists of a hollow sleeve about which is the magnet winding; the ends of the sleeve form the poles of the magnet. A loose plunger operates within the sleeve. The center of the sleeve is largely cut away and the plunger normally occupies a position spanning this center opening. By means of a motor the sleeve is reciprocated, thereby throwing the plunger back and forth by means of the magnetic coupling of the two.

### Business Brevities

A memorial fountain costing \$8,000 will be erected in East Side Park, Paterson, N. J., through the generosity of Mary N. Weight, of New York City. The fountain will be a memorial to Miss Weight's sister, Alice Weight. Miss Weight was a granddaughter of Christopher Breese, one of the early settlers in that section of New Jersey, who came to America from England.

The Stonecutters' Union of Sandstone, Minn., voted to demand a wage increase from 56¼ cents to 62½ cents per hour starting on May 1st.

The Inland Mausoleum Company expects to begin the construction about the middle of May of a \$300,000 public mausoleum at Fairmount Cemetery, Spokane, Wash.

Congressman Kennedy, of Rhode Island, is endeavoring to have a plot of ground set aside in Arlington Cemetery for the erection of a monument in memory of the Sisters of Charity who served as nurses on the battlefield during the Civil War.

A campaign has been started in Hoboken, N. J., to raise a large sum, of which \$114,750 will be spent in the erection of a monument 57 feet high to commemorate the part the Germans have taken in the present war and as a testimonial of the delity of the Germans to the Fatherland.

The General Frederick von Steuben memorial, to be placed at the north entrance of Washington Park, D. C., in memory of the Revolutionary hero, will cost \$30,000. J. Otto Schweitzer, a Philadelphia sculptor, has been selected by the Steuben Monument Association to design and construct the monument.

Street paving aggregating over \$4,000,000 is planned for Scranton, Pa., for the coming season, according to the program of the Department of Public Works.

At the 35th annual election of the Building Material Exchange of the City of New York, held at its rooms in the Woolworth Building, C. J. Curtin, president and owner of the Farnam Cheshire Light Company, was elected president.

Over one thousand workmen employed in the granite quarries at Vinalhaven, Me., have resumed work after six weeks' idleness growing out of a strike of 300 quarrymen, engineers and other artisans. A compromise agreement has been made by the International Union of Quarry Workers and the granite firms providing for a five-year contract giving an advance to a number of the hands from 10 cents to 75 cents a day. The cutters were not on strike, but were forced to remain idle during the strike period.

Nearly three-quarters of the non-union granite cutters employed in the sheds at St. Cloud, M'n., are on a strike. The union men are not affected.

Fred H. Hirth, of Grand Rapids, Mich., has been awarded the contract for Trinity Church at Bostwick Avenue and Crescent Street, in that city.

A committee organized by friends of George Fitch, of Galva,

Ill., has begun work toward raising funds for the erection of a monument to the Peoria humorist, who was buried in that city, which was his old home.

Five hundred striking quarrymen at Milford, N. H., returned to work, having received a 10c. increase in pay.

The laborers employed in the quarries of the Wisconsin Granite Company, at Redgranite, Wis., went on strike the past month because of a difference of opinion over an increase in wages.

The school children of Topeka, Kan., are raising funds for the erection of a statue of Abraham Lincoln on the State House grounds.

The Hartford Sand & Stone Company, of Hartford, Conn., has increased its capital stock from \$50,000 to \$100,000.

### New Companies

The Lincoln Red Slate Company, Inc., of Granville, N. Y., to quarry and manufacture slate. Capital, \$25,000. Incorporators, J. T. Gorman, J. W. Gorman, Cohoes, and D. Flarity, of Whitehall.

The Westchester & Putnam Lime Company, of Peekskill, N. Y., to quarry stone, manufacture lime, etc. Capital, \$6,000. Incorporators, B. Ewing, Richard Baldwin, Jr., B. E. Wood and others, Peekskill.

The Greencastle Good Roads Stone Company, of Livermore, Ky., to quarry and crush stone. Capital, \$8,000. Incorporators, T. D. Renfrow, J. E. Cowgell, William H. Renfrow and Damon L. Cowgell.

The Stephensburg Stone Company, of Louisville, Ky., to quarry and manufacture stone. Capital, \$15,000. Incorporators, James Hartlage, John W. Hartlage and J. Frank Moore.

The Southern States Lime Company, of Kingston, Tenn., to manufacture lime for agricultural purposes. Capital, \$500,000.

The Erie Quarries Company, of Toledo, O., to quarry and deal in stone. Capital, \$75,000. Incorporators, H. R. France, Richard D. Logan, H. E. Blair, D. C. Dean and L. E. Collver.

The San Saba Marble Company, of San Saba, Tex., to quarry and deal in marble. Capital, \$25,000. Incorporators, C. R. Green and C. W. Hall.

The Plano Marble Works, of Plano, Tex., to manufacture and deal in marble. Capital, \$2,000. Incorporators, G. W. Clark, E. W. Reed, M. W. Clark.

Salagona & Co., of New York, manufacturers of marble, mosaics, terrazzo, etc. Capital, \$15,000. Incorporators, Adelina L. Salagona, Emilio L. Salagona, Adolph Giobbe, all of Manhattan.

The Solry Tile Manufacturing Company, Inc., of New York, to manufacture tile, granite stone, etc. Capital, \$100,000. Incorporators, A. B. W. Hahn, P. F. Solan, B. F. Reilly, 15 Classon Avenue, Brooklyn, N. Y.

The Hecla Slate Company, of New York, to deal in slate, marble and tile. Capital, \$10,000. Incorporators, Harry C. Adams, Rose Lerner, Bernard Wertheim and Wm. Kaufman, all of Manhattan.

The P. G. Tiling and Contracting Company, Inc., of New York, to do tiling and marble contracting. Capital, \$10,000. Incorporators, R. C. Peters, P. Golod, S. Sheinberg, 122 West 114th Street, New York.

The Hallowell Granite Works, Inc., of Hallowell, Me., to quarry, manufacture and deal in marble, stone, etc. Capital, \$200,000. New York representative, Hamilton J. Chapman, 42 East Twenty-third Street.

Asbestos Mining and Manufacturing Company, Inc., of New York, to mine and manufacture minerals. Capital, \$100,000. Incorporators, P. Korman, A. H. Brundage, I. Bernstein, 1222 Evergreen Avenue, Bronx.

The Standard Mosaic & Tile Company, of Cincinnati, O., to manufacture and deal in marble, tile, etc. Capital, \$10,000. Incorporators, John M. Mueller, Jr., and others.



# The Laying-out of Stonework—Part XIII

By D. T. PATTERSON, *Edinburgh*

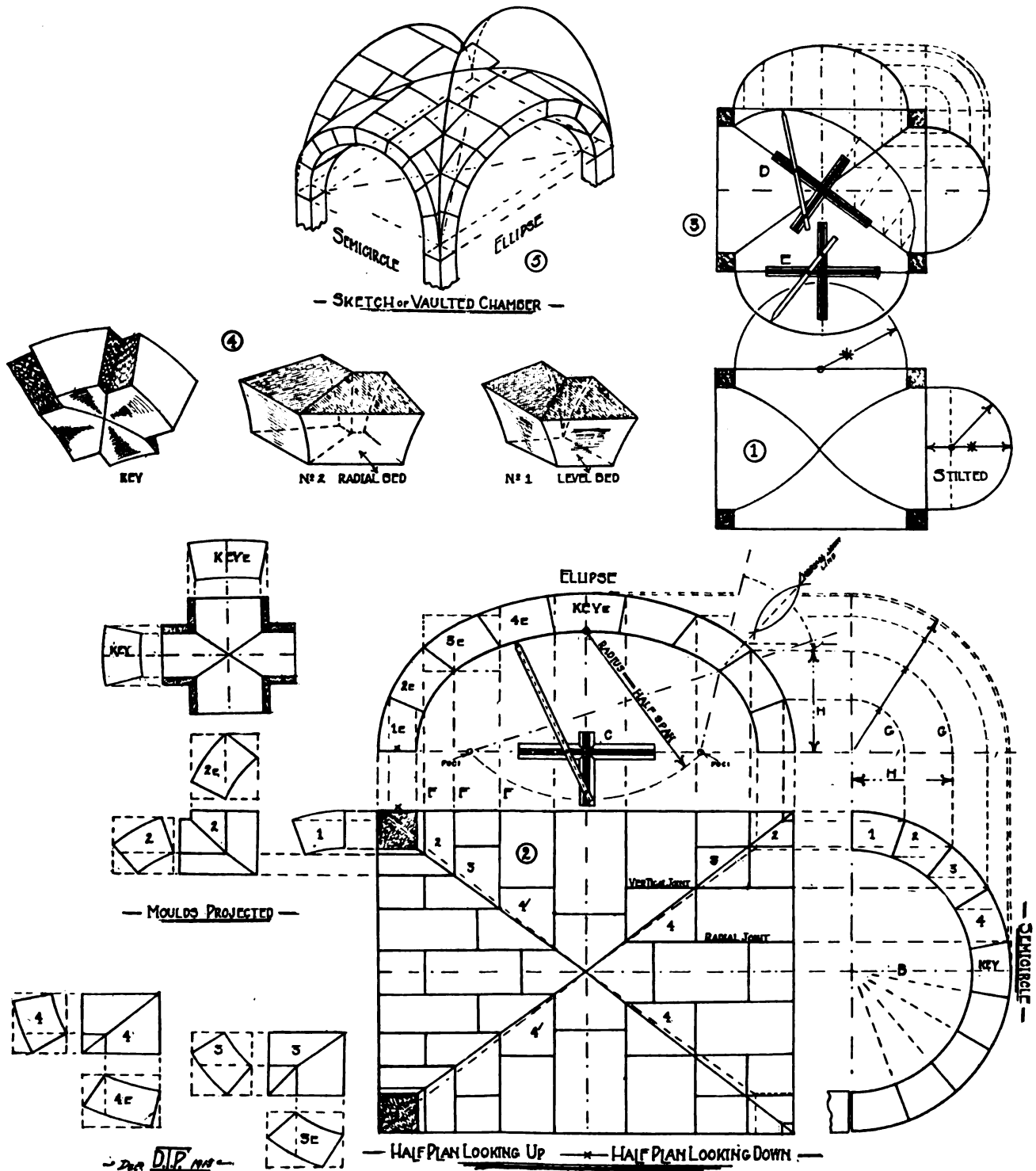
IN my previous article on cylindrical vaulting which appeared in *STONE* in May, 1915, I dealt at some length with what I then termed the simplest type of this class of masonry construction. Readers to whom the art of practical stone-cutting appeals would, therefore, do well to review my article in the above mentioned back number before proceeding to study the present example.

When the vaulted roof covers an oblong plan instead of a

square, as illustrated in my preceding example (No. 6), it presents to the draughtsman much more difficulty, and at the same time brings him into touch with that ever interesting and graceful curve, the ellipse.

If two vaults of the same height at the crowns, and of different openings, are to be made to intersect each other, some arrangement becomes necessary in order that the groins or mitres of the cylindrical surfaces shall be in vertical planes.

## — CYLINDRICAL VAULTING —





It appears that the method of finding the developed profiles of the larger opening and groins from the given arch by means of ordinates was unknown to the Romans, and their system of covering up the difficulty was to stilt the smaller vault, making the curvatures of both vaults semi-circular of different radii; consequently, the groins did not intersect in vertical planes, but, on the contrary, formed waving lines, as Fig. 1.

In the example before us (Fig. 2), the semi-circular vault "B" is the given arch; the larger opening being of the same height from the springing line to the crown consequently becomes elliptical. When dealing with full sized work upon the drawing loft, the writer advocates the use of the trammel for describing this curve, as at C, Figure 2. The method of producing this curve by the aid of ordinates (see Fig. 3) is rarely successful when dealing with full size work.

The trammel at the same time is the most expeditious and accurate method known. Fig. 3 shows both trammel instruments "D" and "E" in position for describing the curvatures of the groin and wider opening. In dividing up the joints of the voussoirs, the intrados of small arch, "B," Fig. 2 is first divided, and the divide of the ellipse, Fig. 2 is found by ordinates projected from the plan, as "FF," Fig. 2. This is further exemplified at Fig. 3. It is worthy of note that the joints of ellipse are not normal to the intradosial curve, but are rather marked off from the springing line equal in height on extrados to those of the smaller arch, "B"; see lines "GG," Fig. 2, where a comparison should also be made of the heights of vertical lines "H H" against the adjoining normal joint line indicated. The necessary bed and joint moulds are clearly shown projected from their respective positions on plan; these should be very carefully cut from sheet zinc about No. 8 gauge. The bed moulds in each case indicate the length and breadth, while the face moulds determine the height of the cube block of stone within which the finished stone is contained in each case, (see dotted lines around detached face moulds). In actual practice the draughtsman need only draw down one quarter of the plan and half the elevation of each arch opening, as the moulds for one groin will repeat all round, but, unlike the above mentioned preceding example, the stones in this instance must be "handed," as for example, the two groin stones marked 4, Fig. 2, are opposite hands, and could not possibly exchange places.

Fig. 4 should prove useful as showing three of the finished stones detached while Fig. 5 will convey to readers some idea of the appearance of one compartment of the type of vaulting herein illustrated and described.

I should like to take this opportunity of thanking the numerous readers of *STONE* who have so kindly complimented me on the success of my efforts in writing these articles on "The Laying-out of Stonework" and it is a great source of satisfaction to the writer to know that his efforts to assist stone draughtsmen have not been in vain.

## Notes from the Stone Fields

### MARBLE AND GRANITE

The property owners of Commerce Street, Newark, N. J., have requested the Board of Works of that city to pave that thoroughfare with grouted granite instead of wood blocks.

The reports of the commercial agencies say that granite is in greater demand in the New Hampshire districts than a year ago, and orders are larger and more insistent, but recent labor troubles have handicapped the output to a great extent. As soon as the labor situation is thoroughly settled, more favorable conditions are expected to prevail than have existed for some time.

A number of notable New Yorkers are planning the establishment of a fashionable art community modeled after the famous Versailles community that flourished under Louis XV of France, at Port Washington, L. I. The purchase of a three-

hundred-acre tract on the shore-front is involved. According to plans, the principal building will be a three-story apartment structure, 1,200 feet long, in which the members of the community will reside. It will be built of marble, with a wide terrace balcony facing the bay.

The Central Mausoleum Company, of Carlisle, Pa., has just completed a large community mausoleum at Shamokin, Pa. The exterior is of granite, while the entire interior is finished in marble.

The Hinman-Boynton Granite Company, Inc., has plans completed for a new building for an office and showroom at its plant near the entrance to Oakwood Cemetery, Syracuse, N. Y.

The Hispanic Society of New York will mark the 300th anniversary of the death of Cervantes, which occurred on April 23rd, by the erection of a splendid marble arch and bronze gate called the Cervantes Gate, on the western approach to the Hispanic Museum, Broadway and One Hundred and Fifty-sixth Street, New York. The arch will be fifty feet high. All the work has been designed by Charles P. Huntington, architect, and it will be a noble memorial to the author of "Don Quixote."

The purchase by the Gouverneur Marble Company of the defunct Northern New York Marble Company and the old Empire Marble Company at Gouverneur, N. Y., rumored last month, has been consummated. One of the quarries will be operated as soon as the weather becomes favorable. The marble will be transferred by rail to the Gouverneur mill and stored for use. The Gouverneur Marble Company will continue to operate its own quarries to its full capacity, as the output is needed in their building branch and for some of their monumental work. The company expects to secure the bulk of its dark stone in the quarries just purchased and they will be opened up very extensively in a short time.

J. W. Morris, formerly a quarryman in the Medical Lake District near Spokane, Wash., but more recently of Stockton, Cal., has purchased a tract near Kramer Station, a mile from Medical Lake, and will open a new quarry. The land is said to have a ledge of high-grade granite suitable for monument work. It is about one-quarter mile north of the quarry of the monumental works which Mr. Morris at one time owned.

The ladies of the Grand Army Circle, of Salida, Colo., will erect a soldier's monument in that city. The order for the shaft has been placed with the Federal Granite Company.

The contract for marble for the interior finish of the new Odd Fellows' Temple at Allentown, Pa., has been awarded to Kline & Sacks, of that town.

One of the handsomest business buildings in Eastern Pennsylvania is the new home of the Second National Bank, at Allentown, Pa. It has just been completed. This was designed by Sauer & Hahn, of Philadelphia, architects. It occupies a corner lot and the material used for the fronts on both streets is North Jay granite. On each front there are four Corinthian columns, each forty feet high, with elaborately carved capitals and bases of polished Deer Island granite. About the finely carved and moulded cornice is an ornamental granite balustrade. The general contractor for the building was George H. Hardner, of Allentown. The granite was furnished by the North Jay Granite Company, while Kurtz Bros., of North Bethlehem, Pa., did all the marble work.

The Mt. Nebo Marble Company, of Salt Lake City, Utah has received assurances that its Birdseye marble, now known as the golden travis, will be used for the interior finish of Government buildings. The company has just received contracts covering final orders for marble for the new Church office building at Salt Lake City. These call for marble for the finish of the reception room. Red golden travis will be used for the columns, light golden travis for the floors, a

lighter shade for the wainscoting and travertine for the mantels.

A. Jenss, of Antigo, Wis., has purchased the bankrupt stock of the Big Falls Granite Works, which he will remove to Marion for disposal.

The Vermont Marble Company is completing an extensive new plant at West Rutland, Vt., for converting marble waste into agricultural lime. It is stated that the output of this plant will be 100 tons of lime fertilizer each twenty-four hours. If the enterprise is a success it will doubtless lead to a great extension of the business, so that the working over of all the dumps of waste marble may be looked for.

Chas. Everett, of Goshen, N. Y., left a provision in his will for the erection of a public memorial in that village. The trustees have decided to accept a monument design by Carl A. Herber, a New York sculptor. The monument will consist of a large bronze figure of a woman representing Orange County, with a wreath of laurels in either hand, placing them on the heads of a soldier and a sailor, which are hewn out of a large block of granite. In the rear of the monument there will be a drinking fountain.

Johnson & Gustafson, granite manufacturers, of Barre, will at once begin the erection of a new plant at that place. The building will be 180 feet by 50 feet, and there will also be an office, 24 by 18 feet. A traveling crane and large compressor have been purchased already. The contract for the erection of the plant has already been awarded. Samuel Johnson retired from the firm some time ago, but the old name is still retained. Aaron Gustafson, the proprietor, is a native of Sweden, but went to Barre in 1904.

A new soldiers' and sailors' monument was dedicated at San Bernardino, Cal., the past month. It consists of a shaft with a figure of a soldier and is constructed entirely of California granite.

During the past month the cornerstone was laid for the new public library building which is to be a part of the new civic center at San Francisco, Cal. The building will be erected at Larkin and McAllister streets and will be constructed of California granite at a cost which will represent a total investment of \$1,650,000. The architect is George W. Kellham. The McGilvray Granite Company has furnished the granite for all of the buildings in the civic center.

Work has been begun on the J. R. Robinson mausoleum in the Chico cemetery, California, which is to cost \$10,000. The work is being done by William Robb & Son. The structure is in the Ionic style and the exterior will be of gray Vermont granite with interior finish of Vermont marble.

P. M. & W. Schlichter, marble dealers, of New York, have leased for a term of years the northerly part of the block bounded by First Avenue and the East River, Thirty-sixth and Thirty-seventh streets, New York, formerly occupied as a marble plant by Feeney & Devanney. The tenants have subleased space to the Eschmann Marble Company, Peter Theis Marble Company, A. Sanelli Marble Company, and Peterson Marble Company.

The granite cutters of Quincy, Mass., 1,400 in number, returned to work on April 13th, after a strike lasting since March 1st. Most all of their demands were granted under an agreement signed with the Manufacturers' Association.

#### LIMESTONE AND SANDSTONE

The Thomasville Stone & Lime Company is making daily shipments averaging 14 carloads over the West Maryland Railroad from its quarries at Thomasville, Pa. The shipments consist of lime, fluxing stone and ground limestone. At present more than one hundred men are employed at the plant.

Owing to the complaints of residents in the vicinity, the Michigan Limestone Company made an agreement before the courts to close its plant in the Louisiana Street section

of Buffalo until machinery can be installed to prevent the spreading of dust.

Milton A. Lain, of Westtown, N. Y., will establish a limestone grinding plant. This is the fourth plant of the kind established in Orange County with the co-operation of the Farm Bureau, the others being operated by James Bull, at Monroe, Booth Bros., at Campbell Hall, and M. M. Lejber, at Port Jervis.

The Oregon Agricultural Limestone Company, of which F. F. Parker and C. W. Jones, of Portland, are managers, has leased the Reidle Limestone Quarries on Robert's Creek, eight miles south of Roseburg, Ore., and will soon begin operating them. The product will be used for fertilizing purposes.

The Norfolk newspapers are making an effort to have established at that place the new lime-grinding plant that the State Legislature has provided for Tidewater, Va.

A delegation of lime manufacturers headed by W. J. Grove, chairman of the Lime Manufacturers' Association of Maryland, called on Governor Harrington of that state and urged him to withhold his signature from the bill appropriating the sum of \$12,000 for the establishment of a state lime plant in Southern Maryland. The association declares that prices of lime are not exorbitant, as charged by the farmers, that the manufacturers have hundreds of thousands of dollars invested in their plants, and that there is no excuse whatever for calling for state aid.

The Tenino Stone Company, of Tenino, Wash., has been awarded contracts for furnishing stone for the Walla Walla High School and for a new federal building at Niles, Hawaii.

For some months past F. R. M. Bloomer, of Sacramento, Cal., has been developing an extensive department of limestone at Shingle Springs, near Folsom, Cal. Development work has progressed to such an extent that improved machinery will soon be installed.

Plans have been filed at Montclair, N. J., for an \$80,000 residence to be erected by W. D. Van Vleck at Mountain Avenue and Van Vleck Street. The building will be 81 by 63 feet in size and will have a facing of Indiana limestone.

#### SLATE

Many of the laborers in the Granville and West Pawlet slate quarries struck during the past month, demanding an increase of 2c. an hour and that they begin work at 7 A. M. instead of 6.45 A. M. About three hundred men are affected.

Three hundred men employed in the slate quarries at Pen Argyl, Pa., went on strike the past month, demanding an increase of 25c. per day in wages. They are now receiving \$1.75.

F. W. C. Hathenbruck will soon resume work in his slate quarry in Slate Canyon, near Provo, Utah. Improved machinery is to be installed shortly.

#### Government Work

The United States Senate has passed a resolution providing for a \$200,000 building replacing the post-office at Paris, Tex., recently destroyed by fire.

Bids will be received by the Supervising Architect, Treasury Department, Washington, D. C., until June 5th for the construction of the post-office at Belton, Tex.; until June 6th for the post-office at Waynesville, N. C., and until June 8th for the post-office at Maryville, Tenn.

The contract for the rubble mound breakwater at Conneaut Harbor has been awarded to the Edward Gillen Dock, Dredge & Construction Company, 112 North Erie St., Racine, Wis., at \$155,680.

Bids will be received at the office of the supervising architect, Treasury Department, Washington, until May 17th for the construction of the U. S. Post-Office at Little Falls, Minn.;

until May 18th for the post-office at Durango, Colo.; and until May 19th for the post-office at Wenatchee, Wash.

The contract for the construction of the new post-office at Falls City, Nebr., has been awarded to Charles Weitz' Son, Des Moines, Iowa, at \$42,600.

Bids will be received by the commissioner of Indian affairs, Washington until May 29th for the construction of stone mess building, two stone cottages, stone gas house, addition to stone school building and boiler house and other work at the Western Navajo School, Arizona.

### Carborundum in Stone Working

One of the most attractive catalogues pertaining to the industry covered by this magazine is "Carborundum Products for the Stone Trade," issued by the Carborundum Company,

#### TURNING MARBLE COLUMN WITH CARBORUNDUM WHEEL

Niagara Falls, N. Y. This immediately catches the eye, for the cover is a perfect reproduction of a polished slab of Verde Antique marble with the title embossed in gilt letters. The booklet consists of 32 pages and is profusely illustrated. The pictures show not only the use of carborundum machinery for sawing, cutting, turning, moulding, rubbing and polishing stone, but also the various processes in the manufacture of carborundum. It is not too much to say that carborundum machinery has completely revolutionized the stone trade, and particularly the marble industry. With the use of this material it is not only possible to work the stone more rapidly than with steel tools or other abrasives, but it means a smoother surface, so that the marble can be polished directly after the cutting without the necessity for laborious and tedious rubbing. Through the courtesy of the Carborundum Company, we are reproducing the illustrations showing the application of carborundum machinery to the turning and fluting of columns. The catalogue should be in the hands of every progressive worker of stone.

### Quarry Notes

C. Gordon Reel has purchased the quarry property at Cedar Cliff near Poughkeepsie, N. Y., and will begin operating it as soon as the weather permits in order to get out stone for road-building purposes. A crushing plant will be installed, and the crushed stone will be coated with asphaltum under intense heat before being laid on the roads. The first work will be done on the Poughkeepsie highways.

The warden of the penitentiary near Walla Walla, Wash., declares that there are not enough convicts at present in confinement to keep both the jute mill at the penitentiary and the Dixie rock quarry in operation. Inasmuch as the farmers have contracted to take the output of jute bags from the mill, the

warden recommends that the quarry be run short-handed for a time.

After several months of inactivity, the quarries of the Rock Cut Stone Company at Rock Cut, near Jamesville and Auburn, N. Y., have been reopened. Extensive alterations have been made in anticipation of what will probably be the best season for the industry. General Manager W. L. Sporborg says that during the winter a large number of orders for spring delivery had accumulated.

The plant of the Greenville Stone & Gravel Company near Williford, Ark., has been closed for a short time for repairs. The plant has a capacity of sixty cars of crushed stone a day.

The Board of Freeholders of Middlesex County, New Jersey, has awarded contracts for crushing stone to the Delaware and Raritan River Quarry & Construction Company and F. R. Upton, of Newark, for supplying crushed stone for the country roads. The company got the contracts for twenty-two roads, and Mr. Upton for six.

Luther Lindauer is rebuilding and remodeling his stone crusher plant at Kaukauna, Wis. He has put in a new crusher with a capacity of 400 tons a day.

The Wisconsin Granite Company, which operates the old Lindahl quarry, north of Grand Rapids, Wis., is putting on more men and expects to operate the quarry to its full capacity from now on. The company has been operating in a small way all winter, but now that spring has come there will be more active operations. The company report several large orders to fill the ensuing season.

A gang of men is opening a limestone quarry in Laguna Creek Canyon, near Santa Cruz, Cal., and expects to use the product for chemical purposes.

### Business Embarrassments

The property of the North River Stone Company, consisting of a crushing plant at South Rondout, N. Y., was sold under mortgage foreclosure on an action brought by the Morristown Trust Company as trustee, the past month. The property was bid in by a committee of bondholders consisting of Henry I. Fox, Nicholas N. Larzelere and Albert R. Place, for \$8,500, which about covers the expenses incurred. The mortgage on the property is \$150,000, and the unpaid interest, etc., amounts to about \$18,000.

Charles F. Laas, builder, of Mount Vernon, N. Y., has filed a petition in bankruptcy with liabilities of \$107,635 and assets of \$59,386 in unliquidated claims for balances on contracts with the Board of Education of New York on Public School No. 20, which has been assigned to creditors, and on the Bridgeport, Conn., High School. The company is said to have lost \$50,000 on the Bridgeport contract.

### Construction Notes

Plans have been prepared for a new theatre building as an extension to Keith's Theatre at Cincinnati, Ohio. The building is to be of four stories, of white stone, and the estimated cost of construction will be \$150,000.

Schwartz & Gross have filed plans for an eight-story office building on Cortlandt Street, near Greenwich Street, New York. It will have a façade of limestone, brick and terra cotta.

Syracuse University has made application for a permit for the erection of the Joseph Slocum College of Agriculture at the University. The building, according to plans, is to be 125 feet wide and 184 feet long and is to cost \$300,000.

Plans have been filed by the building department of New York for a new theatre to cost \$500,000, to be erected on the east side of Broadway, near Forty-ninth Street. The structure will be twelve stories in height, the upper floors designed for office use. The plans are by Lord & Hewlett and Wm.

La Zinsk. The Barney Estate is named as owner, and George Backer as lessee of the theatre part. The façade will be of limestone, brick and terra cotta.

Plans have been filed for a twelve-story loft building at Broadway and West Houston Street, New York, to cost \$350,000. The façade will be of limestone and brick. The plans are by J. Odell Whitenack.

The Alliance Realty Company will erect a four-story bachelor apartment on Madison Avenue, near Sixty-fifth Street, New York. The façade will be of limestone and white terra cotta. The architects are W. L. Rouse and L. A. Goldstone.

Shampan & Shampan, architects, are preparing plans for a new building to be erected for the Young Men's Hebrew

preparing plans for a \$75,000 school for the Schaffler Mission Training School in that city.

The contract for the erection of a \$100,000 gymnasium for Middlesex School at Concord, Mass., has been awarded to Leighton & Mitchell Company, 95 Milk Street, Boston, Mass.

New Bedford, Mass., is to erect a central police station costing about \$150,000. The plans are by L. E. Destremps, of that city, and bids will be received about June 15th.

W. L. & H. G. O'Shea, of Chester, Pa., have been awarded the contract for a \$65,000 church for St. Ledwig's Congregation, in that city.

A Junior High School, costing about \$80,000, will be erected at West Somerville, Mass., after plans by Walter T. Littlefield, 6 Hamilton Place, Boston.

The contract for the new high school at Connellsville, Pa., has been awarded to Walter G. Eccles, New Castle, Pa. The estimated cost is \$170,000.

The State Legislature of Minnesota is considering an appropriation of \$75,000 for an additional building at the State Hospital at Fergus Falls, Minn.

An addition will be built to the Carnegie Public Library at Hibbing, Minn., costing \$55,000. The plans are by W. J. Sullivan, of Duluth, Minn.

All of the bids received for the construction of the police station at Worcester, Mass., have been rejected as too high. The estimated cost of the building is \$250,000.

E. B. Seabury, of Springfield, Mass., has prepared plans for an addition to the high school and central heating plant at Newport, R. I., to cost about \$300,000.

The contract for the new high school at Uniontown, Pa., has been awarded to John J. Gibson and J. C. Knopp at \$79,836.

The congregation of the Nativity of the Blessed Virgin

#### SLOTING GRANITE COLUMNS WITH CARBORUNDUM WHEELS

Association at Fourteenth Avenue and Fiftieth Street, Borough Park, New York. It will be three stories in height, of brick, with trimmings of limestone and granite.

The Ritz Realty Corporation will build a sixteen-story fireproof mercantile building at Broadway and Twenty-third Street, New York, after plans by Schwartz & Gross, architects. The façade will be of limestone and brick. The estimated cost is \$300,000.

The Wesley Memorial M. E. Church will be erected at Bridgeton, N. J., after plans by George E. Savage, architect, of Philadelphia, Pa. The building will be 120 by 80 feet and will be of Holmesburg granite.

Charles M. MacNeill, president of the Utah Copper Company, will erect a five-story private dwelling on Ninety-first Street, near Madison Avenue, New York. The building will have a façade of limestone and marble in the Colonial style, with four Corinthian columns at the second and third stories and a balustrade at the fourth floor. The plans are by Frederick Sterner, and the estimated cost of the building is \$340,000.

John S. Rogers will erect a five-story English-basement building of stone and brick at 53-57 East Seventy-ninth Street, New York, which will cost about \$100,000. The plans are by Trowbridge & Livingston.

Plans are being prepared for an addition to the city hall at Manchester, N. H., to cost about \$75,000.

A new high school costing \$125,000 will be erected at Baker, Ore. The plans are by Lawrence & Holford, of Portland.

The Henry W. Putnam Memorial Hospital Association will erect a hospital at Bennington, Vt., to cost about \$90,000.

A \$90,000 school will be erected at Carthage, Mo., after plans by J. H. Felt & Co., 800 Grand Avenue, Kansas City, Mo.

A hotel at Lookout Mountain, Tenn., to cost \$300,000, is being planned by Charles J. Holden and associates, Mackinac Island.

The Immaculate Conception Parish, of Holyoke, Mass., will erect a parish school after plans by O. E. Nault, of Worcester.

Charles W. Hopkinson, 900 Rose Building, Cleveland, O., is

#### FINISHING FLUTES WITH CARBORUNDUM WHEELS

Mary, of Philadelphia, Pa., will erect a three-story school at Belgrade and Westmoreland streets after plans by Ballinger & Perrot, of that city.

The contract for the erection of a \$75,000 five-story banking and office building for the People's Bank at Harrisonburg, Va., has been awarded to E. W. Minter & Co., 115 Broadway, New York.

The Longest & Tessier Company, of Greensboro, N. C., has been awarded the contract for the courthouse and jail at Mt. Airy, N. C. The estimated cost is \$98,000.

The University of Alabama is considering plans for a \$100,000 library building at University, Ala.

The Turner Construction Company, of Buffalo, has been awarded the contract for the \$1,000,000 freight terminal at West Ninth Street and Main Avenue, in Cleveland, O.

C. Carroll will erect a two-story courthouse at Delphi, Ind., to cost about \$200,000. The contract has been awarded to A. E. Kemmer, of Lafayette, Ind.

The Farmers' National Bank, of Aledo, Ill., will erect a

\$40,000 banking building after plans by Whitsett & Schulzke, of Moline.

The Iowa Savings Bank expects to erect a \$150,000 bank and hotel building at Fort Dodge, Ia.

George J. Hoffman & Co., of Rochester, Minn., are preparing plans for a \$130,000 hotel building at Mason City, Iowa.

The general contract for the construction of the new building for the Milwaukee Athletic Club at Mason Street and Broadway, Milwaukee, has been awarded to the Foster Construction Company, of that city. The estimated cost is \$600,000.

Fulton & Butler, of Allentown, Pa., are preparing plans for a temple for the Scottish Rite Association for Lincoln, Neb., to cost about \$80,000.

The contract for the engineering building for Michigan Agricultural School at Lansing has been awarded to F. Trie, of Saginaw, Mich., at \$121,422.

### Obituary Notes

Capt. David M. Demarest, a member of the firm of M. Demarest & Co., stone dealers, of Brooklyn, died the past month at his home in that city, at the age of 59 years.

J. B. Thomas, traveling salesman for the J. E. Lutz Marble Works, of Blair, Neb., was instantly killed the past month when his automobile went over an embankment. Mr. Thomas was 43 years old, was a veteran of the Spanish American War, and his home was in Newcastle, Pa.

Michael Sullivan, for many years a granite quarryman in Westerly, R. I., died the past month after a long illness.

William F. Hoffmann, a veteran stone contractor of 4016 Lexington Ave., St. Louis, Mo., disappeared from his home last February. During the past month his body was found in the Mississippi River at Girardeau, Mo. Mr. Hoffmann was seventy-one years of age.

### Trade Notes

The Ingersoll-Rand Co., 11 Broadway, New York, have recently issued three new bulletins as follows: Form 3036 on Turbo Blowers. These blowers are suitable for any air service where the capacity requirements range from 3000 to 35,000 cu. ft. of free air per minute at pressures of 1 to 2½ lbs. and are particularly adapted to such work as foundry cupalo blowing; atomizing oil for oil burners; supplying blast for various kinds of heating and annealing furnaces; blowing air for water gas generators; pneumatic conveying systems and for ventilating purposes. Form 3029 describes the "Ingersoll-Rogler" Class "ORC" Corliss Steam Driven Air Compressors of the familiar duplex type with the steam cylinders next to the frames and separated from the air cylinders by open distance pieces. This type of machine is offered in four different combinations of cylinders. Catalog gives sizes and capacities. Form 4120 describes the Leyner Ingersoll Water Drills both the No. 18 and No. 26 type. Catalog explains the construction in detail and illustrates the different types, including numerous installation views. Copies of these bulletins free on request to the nearest branch office.

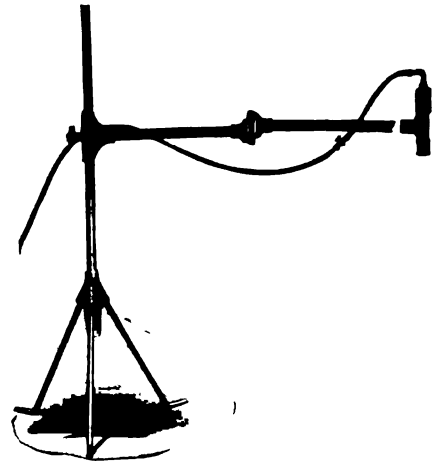
The George Oldham & Son Co., manufacturers of pneumatic tools and appliances, Frankford, Philadelphia, Pa., has recently purchased a complete equipment for a new power installation. Also, the upper floor of this company's present building is now being utilized and a large amount of new equipment is being installed. This will greatly increase the capacity of the plant, which is made necessary by the increasing demands for the company's product.

The Royden Marble Machinery Company has removed its offices to No. 24 East 21st Street, New York.

The accompanying illustration shows the "Little Dallett" Surfacers, manufactured by Thos. H. Dallett Co., Broad and

Federal Sts., Philadelphia, Pa. The "Little Dallett" should be of particular interest to plants having only a limited amount of air at their command and those not having sufficient work to warrant the expense of a big machine for pointing and bushing, although it can also be used to good advantage and saving on work not practicable to put under the larger surfacers.

Three general points taken into consideration in designing same were: to make it light, yet amply strong to stand up under any service; to make it convenient to operate and adjust; and to have the least number of parts to wear—and reference to the illustration will show how well the manufacturer has succeeded in the latter, as the only points subject to any wear, outside of the tool proper, are the post bearing and knuckle joint of the arm. Even under the hardest service no appreciable wear can take place in the post bearing, as the bearing surface is 8 inches long, and the knuckle joint is so designed that it will last indefinitely. The tool used is the standard "Hand Facer" Bushing Tool manufactured by the



THE "LITTLE DALLETT" SURFACER

same Company, and any plant having one of these need purchase the frame only, as the tool can easily be attached. The frame consists of the post bearing, to which are fastened the legs and in which the upright post sets and revolves. The arm bracket, to which is riveted the arm, slips over the post and can be fastened at any elevation within range of the post by a hand screw on the back of the bracket, and the arm is composed of two pieces, connected in the center by a knuckle joint, thereby permitting the arm to be swung in any direction and in a complete circle. The clamp in which the tool is fastened is bolted to the end of the outer half of the arm. The "Little Dallett" is so light it can readily be handled and moved about by one man, and in service the operator simply has to guide the tool over the work, the weight and vibration of the tool being taken by the arm.

"Roebing Wire Rope" is the wire rope bulletin of John A. Roebing's Sons Company, published to impart wire rope information of service to wire rope users. Special articles are written by Engineers of the Roebing Company citing examples of good wire rope practice. Special attention is given to the care and proper use of wire rope in service. Copies mailed regularly, free of charge, to any wire rope user interested.

The E. I. du Pont de Nemours & Company of Wilmington, Del., have just had printed a Clay Blasting Booklet. As it is the first booklet ever issued on this subject it contains valuable and interesting information. Some of the phases covered are "Digging Clay," "Stripping," "Blasting Down Shale," "Digging Plastic Clays," "Mining Flint Clays," "Draining Clay Pits," as well as full information on the use of explosives. The booklet will be sent to any address upon request.



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Carborundum Heads for Planers.

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chines.

Openside Carborundum Machines with  
Turning Head.

Carborundum Fluting Machines.

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Wire Saws.

Carborundum Lathes for Turning and  
Fluting.

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Statement of the Ownership, Management, Circulation, Etc., Required by the Act of Congress of August 24, 1912, Of “Stone,” published monthly at New York, N. Y., for April 1, 1916.

State of New York, } ss.  
County of New York, }

Before me, a notary public in and for the State and county aforesaid, personally appeared Frank A. Lent, who, having been duly sworn according to law, deposes and says that he is the Business Manager of “Stone,” and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Name of	Post office address
Publisher, Stone Publishing Co.,	258 Broadway, New York
Editor, Frank W. Hoyt,	258 Broadway, New York
Managing Editor, None	
Business Manager, Frank A. Lent,	258 Broadway, New York

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.)

Stone Publishing Co.,	258 Broadway, New York
Frank A. Lent,	258 Broadway, New York
Frank W. Hoyt,	258 Broadway, New York
A. C. Lent,	691 W 136th Street, New York

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also in cases where the stockholders or security holders appear upon the books of the company as trustees or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given, also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees hold stock and securities in a capacity other than that of a bona fide owner, and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

FRANK A. LENT, Business Manager  
Sworn to and subscribed before me this  
26th day of March, 1916

WALTER HALLIDAY,

Notary Public Kings Co., 245, Kings Co. Register No. 7094, Certificate filed New York Co., No. 257, N. Y. Register No. 7225 (My Commission expires March 30th, 1917)

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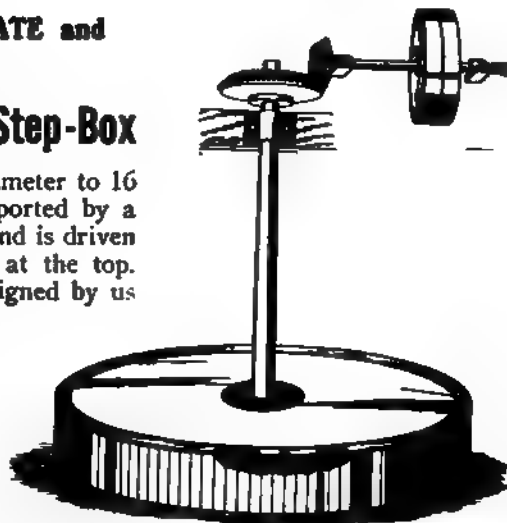
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VOLUME XXXVII

JUNE, 1916

NUMBER 6

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## Some Alabama Stones



PROFESSOR EUGENE A. SMITH, State Geologist of Alabama, has just issued a bulletin giving the statistics of the mineral production of that state for 1914. Professor Smith says that the preparation of cut stone for building purposes in Alabama, while on the increase, is not yet what it should be. Practically all of this material, he says, comes from quarries in the sub-carboniferous limestone of the Tennessee Valley, the most important quarries being at Rockwood, in Franklin county, operated by Foster-Creighton-Gould Company, of Nashville. This stone is quite similar in appearance, composition and other qualities, to the Indiana stone, and so far as experience in the use of the stone from the two localities in the buildings of the University of Alabama goes, the Alabama stone holds its own under influence of the weather better than does the Indiana stone. Stone steps, door sills, and window sills, buttress caps, etc., of the Alabama stone put in place in 1885 show practically no deterioration in color and wear under foot, and in crumbling and roughening under the influence of the weather. The Rockwood quarries have most modern and approved methods of machinery for sawing the stone and handling it in transit to the mills and elsewhere. The stone is of massive formation, of great thickness and extent. Blocks weighing as much as 25 tons, without crack or flaw, are not infrequently quarried, the size of the blocks being practically limited only by the capacity of the hoisting machinery.

The Oolitic variety is most extensively used for building and monumental work. It is of light gray color, uniform grain, and homogeneous texture. It possesses a quality of cheapness, it can be cut to any design required, and is at the same time strong and durable. With the installing of adequate machinery at the quarry for doing the finishing work, there should never be any longer any reason for going outside of the State for this quality of stone. Already the material has been very extensively used in public building in Mississippi, Tennessee, as well as in Alabama. The only reason why it was not used in the recently erected buildings at the University of Alabama was

that at the time these building contracts were let, the quarries furnished only the rough sawn stone and there was not in Alabama any establishment adequately equipped for the dressing of the stone in the quantity needed.

Professor Smith also gives some attention to the marble deposits from Marble Valley, in Coosa county, through Talladega into Calhoun. The crystalline or statuary marble occurs mainly in a narrow valley along the western border of the metamorphic area, extending from Marble Valley in Coosa county, through Talladega into Calhoun. The length of the marble belt through Coosa and Talladega counties is about 50 miles. The width of the valley carrying the marble as a rule is from one-quarter to one-half mile, widening in places to a mile and a quarter, for example in the neighborhood of Sylacauga. The plant of the Alabama Marble Company at Gantts Quarry, which was destroyed by fire in December, 1910, has been rebuilt and equipped with all the machinery needed for the working up of any kind of finished product. Professor Smith thinks that the better quality of Alabama marble is "not surpassed" by any produced in this country and says that it has now a well established reputation and has been used in more than two hundred important buildings in the United States. He describes, in brief, the various quarries in this district that are producing marble. The Moretti-Harrah and the Eureka Company furnish the marble in blocks for monumental and rough interior purposes. A beautiful quality of variegated limestone or marble—red, pink and white—belonging probably to the Cambrian formation, occurs in Shelby county, a mile or two south of Shelby Springs station on the L. & N. Railroad, and extending thence southwest for a mile or two. Nothing but prospecting work has been done on this marble. The Trenton limestone in the Appalachian valleys, particularly Jones Valley below Bessemer, contains marble similar to that quarried in the vicinity of Knoxville, Tennessee. Also as to Pratt's Ferry on the Cahaba River in Bibb county, a quarry was for many years worked in this formation and turned out a very beautiful quality of marble varying in color from gray through pink, red



and brown shades. A black marble which is exceedingly promising, has been reported and some development work done near Anniston, and at Piedmont, Calhoun county, and some very handsome specimens of cave onyx have been obtained from near Kymulga in Talladega county. In the Coastal Plain the St. Stephen limestone of the Tertiary holds ledges of hard, almost crystalline rock capable of taking a good polish. The colors vary from nearly white, through shades of yellowish into red, and it would make a handsome decorative marble, especially for inside work. Other limestone formations, such as the Subcarboniferous and the Knox Dolomite, could in places be drawn upon for marble.

### Active Demand for Asbestos

The United States marketed in 1915 1,731 short tons of asbestos of domestic production, valued at \$76,952. Compared with the production of 1914 this represents a gain of 484 tons, or 39 per cent., in quantity and 306 per cent. in value.

The asbestos of the world is supplied chiefly by Canada. Most of it is exported free of duty to the United States, the greatest manufacturer and user of asbestos products.

An order in council by the Government at Ottawa, Canada, March 25, 1916, placed an embargo on the shipment of asbestos from Canada to other than British ports but permitted shipments to the allied countries, France, Russia, Italy, Japan, and Portugal, on special licenses granted by the British consul. As this order absolutely shut out the United States consumers of asbestos and asbestos products, it was demonstrated to the Government at Ottawa that a great hardship on American manufacturers and consumers would be entailed, and the embargo has been modified to the extent of permitting shipments of crude asbestos to enter the United States if guarantees are given by the manufacturers and their consumers that none of the crude or manufactured material will be re-exported from the United States, except as provided for in the original order.

The requirement that the exporter give a guaranty as to the ultimate destination of the asbestos exported has caused asbestos users in the United States to ask whether a supply is available in asbestos deposits of this country. This inquiry is answered by the United States Geological Survey as follows:

In 1915 there was a great increase in the production of high-grade asbestos in Arizona, the occurrence of which has been described in the Geological Survey reports on asbestos for 1913, 1914 and 1915. The lower-grade asbestos produced in this country comes mainly from Georgia. Both Arizona and Georgia are capable of increasing their output.

Some years ago (1911) Vermont had a productive mine, largely in the chrysolite variety of asbestos, in the same belt of rocks that contain the rich deposits

of asbestos in Canada. For the last few years the mine has not been in operation, but as a result of the Canadian embargo it may again become a valuable source of supply.

Virginia in 1905 and 1906 produced a small quantity of low-grade asbestos that is still used in the manufacture of a local asbestos product. The fibre is of the amphibole variety and slip-fibre type. It was quarried near Body Camp and hauled 12 miles to a mill at Bedford City.

There has been much interest in the asbestos reported from the Casper Mountain and other regions in Wyoming. Some mills have been erected, but although there has been as yet no commercial production the quality of the fibre, in part chrysolite, is locally encouraging.

Idaho has in the Kamiah region large deposits of material like that of Georgia. California has produced asbestos, generally of low grade, at a number of points.

On the whole the encouraging outlook in Arizona, which includes also the Grand Canyon region, with the possible resumption of production in Vermont and an increased production in Georgia, may be expected to make up at least part of the loss by embargo in Canada.

### New Buildings for the Grand Central Terminal District

Plans have been filed for another new and important group of buildings in the Grand Central Terminal district, New York. These call for an outlay of no less than \$7,350,000. Largest of the projects is the twenty-six-story Terminus Hotel, to be built by the New York State Realty and Terminal Company on the block bounded by Forty-second and Forty-third Streets, Lexington Avenue and Depew Place, 275 by 208.4 feet. It will cost \$6,000,000. The lessee has been reported to be Manager Bowman of the Biltmore. The building will be in the French Renaissance style of architecture, with a facade of limestone, marble, brick and terra cotta. One of the leading features will be a ballroom on the fourth floor larger than any other in the city. The architects are Warren & Wetmore, who designed all of the terminal buildings.

The twenty-nine-story Commercial Hotel, 50 x 98.9, for the south side of Forty-second Street, 300 feet west of Sixth Avenue, is projected, to cost \$600,000, by Helmle & Corbett, architects for the Bush Terminal Company. It is designed for showrooms, offices and the commercial service of big firms needing metropolitan clearing house facilities.

On the site of the old Berkeley Lyceum, on the north side of Forty-fourth Street, 250 feet west of Fifth Avenue, the Berkeley Arcade Company plans to erect seventeen-story offices and store, 100 by 200 feet, to cost \$750,000. The architects are Starrett & Van Vleck. James T. Lee is president of the company.

## Architecture and Sculpture



LAST month we spoke of the increasing use of sculpture in our public and private buildings and we quoted from an English architectural journal as to the relations between these two branches of art. One of the best discussions of this subject was given some time ago by Charles Haines Smith, a prominent English critic. Mr. Smith used the term "sculpture" to imply the sculptured representation of natural objects in their natural form, while by "carving" he would designate the representation by the same means of conventionalized forms of ornament. He declared, first, that the object of architectural sculpture is to beautify, not merely to be beautiful. It is not sufficient that a building should be beautiful in proportions,

and its sculpture beautiful in form. This might be the case without the slightest sympathy between the two, and in such circumstances the two arts would defeat one another, instead of being mutually contributive to a harmonious whole. A clumsy, ill-built and ill-proportioned building, encrusted with the most exquisite sculpture, is not beautiful, nor is a fine architectural achievement enhanced by ill-conceived and ill-executed sculpture.

Secondly, it is of the greatest importance that the sculpture, being perfectly sympathetic in style with the building, should also be sympathetically disposed about the edifice. On no pretext must its presence be allowed to disguise or weaken or falsify the structural lines of

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the building. For it is as obvious as anything can well be that the first beauty of a building is its strength. If that strength be disguised in the smallest degree all ornament is nothing but an additional burden upon the apparent weakness of the building. The blank wall of a reservoir-dam is beautiful in its impassive strength, and that strength is of such paramount importance that the least ornament would be trivial and weakening in effect, unless placed at the very crest of the wall above the known water-line. But sculptured figures standing on the coping would be perfectly permissible, even desirable, if not on too large a scale, for by their very lightness they would serve to accentuate the massive power of the dam.

Another example may be drawn from the borderland of architectural and engineering, viz. the decoration of a bridge. Here it is plain that while massive sculptures may be piled upon the spring of the arch on either bank, no free sculpture must appear over the keystone except perhaps in the form of a small figure on the keystone itself (as, for example, in the arch of Titus, at Rome); while over each pier the groups of sculpture which may be introduced must be pyramidal in the general scheme of their composition. The Charles Bridge, between the Mula-strana and Nove-strana, at Prague, is a good case in point.

The sculptures which may appropriately flank the approach to a bridge are free and lively compositions of broad base. The Boadicea group on the Embankment is worthy of note as a fine bridge-sculpture viley placed. It should face away from, not across the bridge, and a corresponding group should appear on the opposite side, to say nothing of a pair at the Lambeth end of the bridge. The Pont Alexander III, at Paris, exhibits well-placed groups of sculpture. These, however, are instances of the axiomatic necessity which is incumbent upon the sculptor of paying due respect to the structure which he is to adorn. But, as a matter of fact, his mission is a far higher one than this.

The great difficulty which retards the progress of sculpture as a means of architectural adornment lies not so much in the arts as in the artists, for I must include both architect and sculptor in my mild indictment. The mutual respect which undoubtedly does not exist between the artists of both branches of beauty—the structural and the plastic—is, I fear, largely colored by mutual distrust—a circumstance of which the immediate outcome is a lack of perfect co-operation. This lack of co-operation has for its fruit a corresponding lack of harmony between the respective provinces. I have pointed out elsewhere that the general impression conveyed by the sculptured figures on London buildings of recent date is that they have climbed out on to the tops of the windows or on to the parapets, and continue to recline upon their giddy couches because they are unable to retrace their perilous steps. In other words, they form no integral part of the build-

ings which, by their mere presence, they certainly do much to adorn. This impression can only be due to the fact that these buildings could perfectly well dispense with their presence—that sculpture is not an inherent part of the design, but may be included or omitted according to the margin of “extras” that the funds are likely to bear. The architect feels—and often rightly feels—that his powers of design are in no way dependent upon extraneous adornment, and thus is rather inclined to regard the sculptor in the light of a rival than a coadjutor—a feeling which is bound to react upon the sculptor and to have a detrimental effect upon his work.

It is perfectly true that a building would stand as firmly upon its foundations, that its proportions may be as true, its spirit as noble and its utility as complete without the aid of sculpture as with it. But in one respect a building upon which no sculptured figures find a place falls short of the highest glory. It has no voice, it is silent, uneloquent of its purpose. Even a prison, whose grim soul is the very spirit of silence, may render its grimness more telling if it be sombrely enriched with appropriate sculpture.

It may be granted, then, that the use of sculpture is, at times, of actual value to the architect, and this being so, all that remains to be insured is that such sculpture be, firstly, of the right kind and, secondly, rightly used.

It is at this point that I would beg your leave to illustrate my remarks by the description of the most complete and perfect scheme of decorative figure-sculpture in the world, viz. the Parthenon. And in my account of its sculpture I shall regard that monument of Athenian greatness not so much from the purely architectural as from the national and spiritual point of view, paying as much regard to the circumstances of its conception and the purpose which it served as to its actual form.

The decoration of the Parthenon consisted, as I need hardly remind you, of the pedimental sculptures, the Doric frieze of metopes and the Ionic frieze which ran along the top of the outside wall of the cella. The natural approach to the temple was towards the western front, and from this point it was open to the visitor to proceed to the eastern end and main entrance either along the southern or northern side of the temple. The most natural route would be along the northern side, straight down the central vista of the Acropolis.

Naturally, the first sculpture to strike the eye was the great pedimental group representing the contest between Athena and Poseidon for the land of Attica—a story of intensely local interest, the choice of which marked down the Parthenon as a deliberate claim upon the goddess as the patron saint of the city to which she had given her name in the far-off days. Thus the story chosen for representation brings home at once and forcibly the intensely national aspect of the goddess and her shrine, and prepares us for the general

scheme of decoration and its ultimate *dénouement*, dramatic in its simple force.

Strong and telling in the clear Attic sunlight the vigorous relief of the metope sculptures next claim the eye. The nature of the Doric frieze demands the representation of detached groups in a severely square frame. Thus all depend upon vigor of action and power of line and shadow, if the monotony of the obviously structural frieze is to be relieved without falsification. And on this principle we have a series of pictures representing vigorous action—Greek and Amazon in deadly conflict, recalling the deeds of Theseus, the greatest hero of old Athens, in the days when the gods walked the earth—and thus the local appeal of the building is further emphasized.

Lastly, the Ionic frieze, glowing with color and gold in the subdued light reflected from the pavement within the peristyle, startles with its innovation, and carries the spectator insensibly along with it. Running from south to north, it turns the northern corner and continues along the northern side, the movement of its figures ever increasing in speed and vigor, so that the eye scarcely heeds the detached figures of the outer frieze in the irresistible charm of the onward-sweeping orderly tumult, and detail after detail, sought and recognized, goes to complete the graphic picture of the great national act of imperial worship, the Panathenaic procession, with its knights, its elders, young men and maidens, old men and children, all pressing forward and carrying the spectator with them, till, almost as one of themselves, he turns the northeastern corner and stops before the very door of the holy place. And here again the majestic size of the pedimental group calls back the enchanted eye to gaze upon the divine origin, the Olympian miracle of the birth of Athena from the very head of Zeus; the universal arrests and surpasses the local aspect of the goddess, and the horses of the rising day and sinking night alone can encompass the marvel. The impression deepens in the mind that the tutelary goddess of Athens is great indeed—a goddess of might in all the world, and the eyes, dropping from their reverent contemplation, rest upon the metopes—vigorous sketches in marble of the triumph of the Olympians over the powers of the earth, the giants. The gods indeed are great, and Athena is chief among them.

Once more to the frieze. No longer a stream of living movement, but a peaceful circle of the gods themselves, seated and watching the approach of the great national Attic procession in the honor of her, the noblest and most spiritual of them all. And in their midst a priest, who hands to a little acolyte the folded robe, now to be replaced by that new garment offered to the deity by her loving and grateful people, and once more the intensely loyal aspect of Athena is brought home to him who reads the sculpture aright.

Lastly, the great dim portal greets the eye, and invites entrance to the sanctuary. Enter. Leave behind

you the bright, hard glare of the mid-day sun, trembling on the blue-gray limestones and glittering Pentelic marble. At once you are plunged in the cool golden twilight that filters through the thin marble tiles, and your shadow slides before you on the pavement to melt in the soft haze of diffused light that is almost darkness to your yet unaccustomed eyes.

Look straight before you, and out of the amber gloom there grows slowly the towering form, clad in gold and jewels, particolor of enamel and cunningly wrought metal, of the very goddess herself—Athena—Athens imperial and incarnate, the spirit of the past, the pride of the present, the hope of the future, whose calm, ivory-white features glimmer ever more clear as her blue eyes gaze steadily out and beyond over her beloved Attica, toward the hill whence the stones of the temple wherein she stands were hewn by her devoted people. It is a climax, superb and supreme, to which the sculptor has led you, insensibly, irresistibly, because the source of his inspiration, and of that of the architect, was one and the same source, because the Parthenon without its sculptures had been a mere shell, dead and meaningless, and because those sculptures, divorced from their surroundings, could lead nowhere, could serve no purpose and tell no story of a nation's passionate devotion.

Like Æsop of old, I must find for my parable a moral. The moral is this—that the purpose of the building must be the inspiration of both architect and sculptor, and that the two must work together to such an extent that the architect shall so design his building as to be incomplete without sculpture, even to the point of sacrificing something of purely architectural effect, while the sculptor for his part shall acknowledge that the mission of his work is to accentuate and enhance the broad strength of the architectural forms, to lead the mind to the contemplation rather of motives than of forms, rather to the spirit of the whole than to the perfection of the part with which he himself is immediately concerned. Mutual forbearance, mutual self-sacrifice and a common interest will, I think, soon relieve our public buildings of the spectacle presented by fair forms of stone clambering along perilous parapets and reclining cumbrously upon giddy gables, of rows of columns obscuring ill-shaped friezes, or officious statues blocking out the daylight from all-too-modest windows. Sculptor and architect must be not rivals but allies, firm knit in loyal service to stern utility, whom they exist but to ennoble and adorn.

### A Producing Marble Quarry in California

Mr. W. B. Tucker, field assistant of the California State Mining Bureau, has written a report of the marble deposits of Tuolumne county, which is just issued in one of the bulletins of that State. There are several marble quarries in the county, which are now idle, but the Columbian Marble quarries are being ope-

rated. These quarries are situated three miles northwest of Columbia and seven miles northwest of Sonora, on a ridge southeast of the Stanislaus River. This company has been under steady operation since 1891, producing three grades of marble—medium, light and dark—and turning out a product that in beauty, durability and susceptibility to a brilliant polish is the equal of any in the United States. Besides the white, veined and black marble, it also produced a pretty blue marble, and a beautiful buff with red streaks, known as Portola. The marble is very hard, running as high as 11 cubic feet per ton, which makes it especially valuable as a durable stone. A body of marble one mile long with a depth of 800 feet and width of 200 feet has been developed, estimated at about 211,200,000 cubic

feet. The stone is quarried in blocks weighing 380 tons each, accomplished by cutting a vertical groove 10 feet deep around three sides, covering a space of 420 square feet. Then channeled holes 6 inches apart, 6 feet long, are drilled horizontally along the exposed vertical face on a line with the bottom of the groove. Then plugged and feathered. The block is subdivided into sections weighing 15 tons, which are hoisted from the pit by means of derricks, and placed on cars and transported to the gangsaws. The equipment consists of eight gangsaws, and an Ingersoll-Rand compressor furnishes air for the drill. The company owns and operates its own electric power for light and plant, and about 35 men are employed. The office of the company is at 268 Market Street, San Francisco.

## Dangerous Structures



HERE is as much profit in studying failures in any branch of work as in considering only the great successes. We must learn what to avoid as well as what to imitate. W. G. Perkins, district surveyor, recently read before a meeting of the Concrete Institute in London, a practical paper on "Dangerous Structures."

Amongst the causes of a dangerous structure are the following:—(a) faulty construction; (b) faulty materials; (c) faulty design; (d) decay and fatigue; (e) overloading; (f) removal of extraneous support; (g) wind pressure, shock, etc; (h) fire and explosion, bombs, says Mr. Perkins. "I propose to enumerate a number of cases where failures have resulted from one or more of these causes; particularly (a), (b) and (c).

"Perhaps few of us have had any experience with failures arising from faulty design and materials in modern structures, as a sufficient period has not elapsed for time to have done its work, but there are numerous instances in buildings erected by former generations. We moderns are often called to account for the supposed inferior manner in which we build, being told that our buildings are not solid like those erected in 'the good old times,' that we have lost the art of making good mortar, etc. People who make such remarks have, I fear, only an acquaintance with the jerry-builder of the very bad type. The majority of buildings erected in London 100 to 200 years ago were constructed in a most inferior manner. The mortar appears to have been compounded with a fat lime, dry slaked, and, judging from the nodules of loam it contains, mixed with a good deal of the 'top spit' of the field. Naturally such stuff has, and had, no binding qualities, and to this day is only so much dusty rubbish. The bricks were badly shaped and easily broken, so much so that in taking down old walls one finds course

after course of what appeared to be headers to be only 'bats.'

"In many old buildings the main beams of the floors are placed diagonally and the loads from the roof and four storeys are imposed upon a pier of brickwork about 14 inches square. Needless to say, such piers have crushed. Strangely enough, this kind of brickwork is always stronger in damp positions, the moisture having enabled the lime to a certain extent to set. Workmen refer to this state as being 'water bound.'

"Again, I have found a wall of this period built with two skins of brickwork, 4½ inches thick, 'tied' together with wooden laths at intervals of about 18 inches in height, the space between being filled with small pieces of brick and stone. A form of construction frequently found is a shell of 4½-inch brickwork around a stout timber post. You see the brickwork bulging and wonder why a stout-looking pier, perhaps 2½ bricks square and 8 feet in height, should be failing under a comparatively light load. The explanation is that the timber post has decayed at its lowest end and the thin shell of brickwork is unable to carry the superstructure.

"Modern brickwork is not without its faults, due principally to the lax manner in which it is supervised and an imperfect knowledge on the part of the specification writer. He will, for instance, require that four courses shall not exceed 12 inches in height, and then select bricks that are very little less than 3 inches in thickness. The consequence is that the bricklayer, to keep to the specification, will put an insufficient bed of mortar in laying the bricks. I have had as much as 3 feet of glazed brickwork at a time taken down because there was absolutely no mortar in any of the beds. And this was on a first-class job, under architects and a clerk of works. Again, when the bricks have a frog, that frog should be upwards when the

brick is laid, otherwise the brick beds only on the rim and its bearing area is reduced by one-third. When the bricks have two frogs, one should be 'buttered,' or filled in before laying.

"Unless strictly supervised, the vertical joints are never filled solid. Some mortar is rubbed over the top of the course with the flat of the trowel, which may enter the joints some three-quarters of an inch. A habit of the bricklayer, after having spread the bed is to work the mortar away from the center with the point of the trowel. The mortar does not squeeze along and make a solid bed as some people argue. To ensure solid work the beds should be thickly spread and the bricks pressed down into it, frogs up, and the whole course grouted up by heaping mortar on the wall and softening it with water from a 'gauge pot' so that it becomes soft enough to flow into the vertical joints until they are full.

"Unless the beds and joints are full you cannot expect to get the full value out of your walls and piers, which, by the way, are always eccentrically loaded. The evil is aggravated when the wall is faced with stone, for the mason generally spreads a bed of putty, 3 or 4 inches wide, along the outer edges of the stone he is laying (which may be 14 or 18 inches on bed), points up the back edge, and after having poured some grout down the vertical joints, considers he has made a solid job! Have this stone taken up again and note the result. Workmanship of this sort leads to 'flushing' and the fall of pieces of stone. The bed of every course of masonry should be screeded.

"Many people object to slate damp-proof courses, as they become inefficient owing to the slate cracking. They only crack or crush when they have been imperfectly bedded. The usual way is to lay them on a bed of cement (perhaps containing a number of small stones) and tap them down with the trowel. This always results in the centre of the slate being unbedded. Walk along such a damp course on your heels, and you will demonstrate to the builder in a striking manner the hollowness of his work. Use cement made with a sand that contains no small stones, rub each slate well into its bed, and you will get a damp-proof—not a damp—course.

"I am not partial to asphalt damp-proof courses

unless they are of genuine asphalt. Artificial asphalts are brittle when cold, but become soft in the heat of summer or near a heating chamber, and squeeze out. This allows settlement, and in the case of a retaining or other wall with a lateral thrust to sustain, may allow sliding on the bed, a result which happened not very long ago 'somewhere in the Midlands.'

"Failures have occurred by using unsuitable materials in the composition of concrete. There was the case of a reservoir where blast furnace slag was used as the aggregate for its concrete walls. The water affected the concrete so that it became quite soft and rotten, and the walls had to be rebuilt.

"Concrete made with breeze is a dangerous material. It is one of the materials specified in the London Building Acts as a fire-resisting material, and as a district surveyor I have, much against my better knowledge, to pass it. This stuff was used for the floors of sculleries in the first storeys of a row of houses built under my official supervision. In every house this stuff expanded, pushing out the walls, some of which had to be rebuilt. In another district I had to inspect a block of residential flats, the walls of which were bulged at every floor level, owing to the expansion of the breeze concrete.

"The term 'foundation' is sometimes used in a very indefinite manner, and may mean the actual base upon which the superstructure is reared or the soil itself. It has been suggested that the proper meaning of the word is the artificial arrangement or construction pre-

#### FAILURE OF A CONCRETE RETAINING WALL

Sixteenth Street Bridge at Bedford, Indiana, built in 1915. Because of the weakness of the retaining wall, it was necessary to build the buttresses to hold it in place within a year.

pared or made to support the base of a superstructure; whilst the soil beneath should be termed the foundation bed. Foundations are important, as when defective or insufficient they will lead sooner or later to a dangerous structure.

"In dealing with structures rendered dangerous by settlement owing to the insufficient bearing capacity of the soil, I prefer, wherever there is an underlying stratum of firm material, to sink down to it, even though it should be at a considerable depth. The sinking should be in the form of pits (the area of which would be determined by the loading and the bearing capacity of the firm material), filled up with good mass concrete. Then from pier to pier either construct beams of reinforced concrete or fix rolled steel joists encased in a rich and well-graded concrete or turn arches.

"I am not an advocate of raft foundations, for unless your structure can be symmetrically disposed about the raft or its centre of gravity be made to coincide therewith—a very difficult thing to do except in a symmetrical building—the pressure on the soil will be unequal, the raft will tilt and throw your structure out of the perpendicular. The same thing will happen if the soft soil is not of even consistency and bearing value all over.

### Stone Production in Canada

The stone business in Canada is naturally affected by the European War in which the Dominion is involved. The full effect of the conflict on the industry will not be known until the statistics for the past and the present are made public. At present, there is available only an analysis of the output for the year 1914, compiled by Mr. John McLeish, chief of the Division of Mineral Resources and Statistics of the Canada Department of Mines. The output of slate for 1914 was valued at only \$4,837, by far the smallest amount during the past fifteen years for which the records are given. As in the United States, the slate industry in Canada is steadily decreasing in volume. The figures for 1914, for instance, should be contrasted with those of ten years ago, when the output was valued at \$23,247. There have been no exports of slate since 1896 with the exception of 1908 and 1909, when the amount was very small, while the imports have ranged from \$100,000 to over \$200,000 per year. The total production of stone in 1914 was \$5,469,056, as compared with a value of \$5,504,639 in 1913, showing a slight decrease, amounting to \$35,583 or less than one per cent. The number of active firms reporting in 1914 was 219, and the total number of men employed was 5,929. Of the total value of the 1914 production, limestone contributed \$2,672,781 or 48.9 per cent.; granite, \$2,176,602 or 39.8 per cent.; sandstone, \$487,140 or 8.9 per cent.; and marble \$132,533 or 2.4 per cent. By provinces, Quebec again shows the largest

output, having a value of 41.8 per cent. of the total, while Ontario takes second place, with a production of 23 per cent. of the total. The exports of stone from Canada in 1914 were valued at \$72,080, as against \$93,840 in 1913. The total value of the imports of stone during 1914 was \$1,252,869, showing a decrease of about 23 per cent. over 1913. During both 1913 and 1914, the imports were derived chiefly from United States and Great Britain, the United States supplying building stone, paving blocks and marble principally, and Great Britain mainly manufactures of granite. Marble is also obtained in some quantity from Italy and other countries.

### Stone and Long Distance Transportation

A Maine newspaper comments at some length upon the bankruptcy of one of the leading granite companies of that State, and it finds the transportation question one of the most vexing problems to be met. The writer says:

"If request for granite and slate could be encouraged, Maine has superior qualities and the quantities are limitless. If it is possible to create demand, effort will be needed on the marketing end we should suppose. We fear that the resident producers and manufacturers of the State long ago began to fall down in matters of finding out where their goods could be advantageously placed, and in making sure how consignments could be delivered at points well removed when they were wanted.

"About every agency for long distance carrying was originally provided by co-operative procedure on part of each State by co-operation with some of its own citizens. That was well enough to point where the carrying demands were confined to boundaries of each State and to point where control of the railroad remained in that State. It was not and is not so well for the people of any State to make and press demands upon resident (long distance) managements that cannot be met by them, and that it is no part of their duty to meet—demands that are provoked by nonresidents whose knowledge of the needs is little and whose ambition to know appears to be less.

"To our mind there is pressing need of a co-operative effort on part of every section and every citizen of the State, looking to seeing what can be done to eliminate all that makes for discouragement and distress industrially in favor of the interpolation of whatsoever it may be found necessary in order to encourage improved conservation and utilization of our God-given resources.

"According to reports from every direction, the people of most of the other States are having about all that they can attend to with their own long distance transportation trials and tribulations. It is hardly to be expected that they can, if they would, be of assistance to us. We have had enough of theory. We are up against a situation."

## Factor of Safety in Quarry Machinery



THE term "factor of safety" is frequently used in this country in reference to quarry machinery, as it is also applied in all forms of engineering work. It may be doubted whether those who freely use the words know precisely what they mean, although dependence may be placed upon them as a sort of blind guarantee of strength. Our building and engineering work is on a vaster scale than is generally attempted in other countries, and consequently we have need to employ enormous blocks of stone. This means the severest stress on ropes and hoisting machinery, and risks are taken that are based solely on "factors of safety." Some time ago Mr. C. E. Stromeyer read a paper on this subject before an engineering society in England, and his remarks were summarized and commented upon by *The Quarry*. Mr. Stromeyer pointed out that the expression, "factor of safety," was originally introduced for the purpose of inspiring confidence. It is generally understood that a machine or appliance such as, for example, a haulage rope or a quarry crane, with a factor of safety of say five, had been tested to five times the maximum stress for which it was designed, and in this general sense the term implies a margin of safety which seems to be an efficient safeguard even against occasional overloading.

On the Continent it is more usual to employ the expression "permissible working load," or some such term, instead of "factor of safety," and there is much to be said in favor of this practice. The term "permissible working load" possesses the advantage that a definite limit of safety is guaranteed by the manufacturer's tests. "Factor of safety" virtually means nothing at all. It is a figure obtained in part by laboratory tests, in part by mathematical calculation based upon assured knowledge which is frequently wide of the truth. As Mr. Stromeyer said, "the mathematical formulæ used by engineers are of the crudest, and do not correctly determine the actual stresses produced by external forces." It is generally assumed that the factor of

safety in, for example, a piece of metal, is the ratio of ultimate stress to elastic limit. Thus, if the ultimate breaking stress is 20 tons, and the elastic limit is four tons, we say that the factor of safety is five. But it is not by any means an easy matter to determine either of these figures with accuracy. The utmost that can be done is to take the mean of a number of tests often widely divergent. Mr. Stromeyer indeed went so far as to say that in certain cases the figure called "factor of safety" is made up of 50 per cent. of mathematical convenience and 50 per cent. of ignorance as to the true value of the elastic limit. The truth is that the elastic limit is a somewhat inconstant quantity. As we now know from the results of fatigue experiments, the elastic limit is reduced by repeated stress, and this is a consideration which possibly assumes great importance in connection with such appliances as wire ropes.

Then we have the influence of the law of probability. There are innumerable small causes which may influence elastic limit one way or the other to a slight degree. These may generally tend to neutralize each other, but under certain conditions they may be cumulative. Thus if there are 10 of these minute influences at work, each capable of influencing the elastic limit either positively or negatively to a slight extent, say one ton, this will give  $2^{10}$  or 1,024 possible combinations

### CONCRETE BRIDGE AT LEATHERWOOD, IND.

This structure was erected only a short time ago and yet it is already beginning to go to pieces. The cement is leaching out in many places, leaving the stone aggregate exposed.



of chances, giving a total range of 10 tons in the break down point, and there is one chance in 1,024 that all the influences will be adverse. Similarly we may calculate other chances, with the result that there is always a possible error, and also a probable average error, in the experimental determination upon which the "factor of safety" figure is based.

Let us take another case of the greatest importance in quarrying operations, viz., the difference between static and dynamic stress, that is, between dead loads and live loads. In the textbooks it is usually shown that a load which is applied suddenly results in a stress which is twice as great as that which a gradually increasing load will produce. Mr. Stromeyer believed that this is not true in all cases, and that suddenly applied loads often produce a much greater stress than double the static effect. We are here apparently in a state of profound ignorance, and have been too ready to deduce a general law from insufficient data.

The above examples go to show how mythical the "factor of safety" figure may be. Permissible safe load would seem to be a far more trustworthy guide in practice; but even in this case the term has only a limited application on account of changes due to the ageing of materials in use. A steel rope may start from the factory with a high breaking limit, but this becomes continually lower in use, partly as a result of continued and repeated stresses inducing fatigue, partly by reason of deterioration of the material. The latter factor is especially serious in the case of certain metals and alloys entering now somewhat largely into the construction of machinery of all kinds. Mr. Stromeyer remarks that the risk of ageing is so great that some engineers are becoming shy of using certain nickel-steel alloys and some brasses and bronzes, because these sometimes become absolutely rotten after a time, even although they may be perfectly satisfactory when new. There is much yet that remains to be investigated in the mysterious diseases to which some metals seem to be liable.

Although we have called attention to some of the defects that may vitiate "factor of safety" calculations, and to the uncertainty in which this term is often involved, it is not to be concluded that no value at all is to be placed upon such figures. Engineers have, of course, long known what degree of faith should be placed in values so computed. The danger arises from those who take "factor of safety" too seriously, and are thereby led to try and get too much out of machinery, or to misuse appliances, and especially to delay necessary renewals. We have a lively recollection of travelling up a steep incline in a German quarry, where we were literally hanging on a rope whose appearance suggested the last stages of senile decay, and we were scarcely encouraged by the assertion of our worthy guide that a new rope was actually ready to be installed. Even in this case, however, the "factor of safety" proved to be sufficient for the work in hand, possibly

because the thousand-and-one chances computed by the laws of probability were not on this occasion all adverse. We can scarcely refrain from the belief, however, that not a few quarry accidents arise from working too near the limiting conditions, with an insufficient margin to allow of possibilities which cannot be mathematically defined.

### The Colusa Sandstone

The California State Mining Bureau, Fletcher Hamilton, State Mineralogist, has published a number of bulletins describing the mines and mineral resources of the different counties of the State. Walter W. Bradley, field assistant, gives a description of the well-known sandstone that is produced in Colusa. This is obtained from a series of massive beds just east of Sites and extending eight miles north and south, with a width of over one-half mile. Sites is the terminus of the Colusa and Lake Railroad, narrow gauge, which connects with the Southern Pacific main line at Colusa Junction. There the stone has to be transhipped to the standard gauge cars. Principally for this reason, the stone is not dressed at the quarries but at the yards in San Francisco. There are two quarries which are operated commercially, the Colusa and the McGilvray. They adjoin, the first named being the older, and to the north. Both properties have railroad facilities. The canyon of Stone Corral Creek cuts through the series nearly east and west at about the center of the Colusa company's ground. The individual strata vary in thickness up to 18 feet so far as opened up by quarrying operations. The stone is very even grained and is quite uniform in color, being a blue-gray which darkens but slightly in weathering. It is especially well adapted for general use as a building material. Colusa sandstone has been employed so far principally in San Francisco and other central Californian cities. Some has also been shipped to Hawaii. The quarries of the Colusa Sandstone Company, three-fourths of a mile east of Sites, was first opened in 1891. The Ferry Building, San Francisco, 1896, was the first large building constructed of this stone. The sandstone can be obtained in any desirable dimensions. There are four monolithic columns in the Bank Building, at Santa Cruz, from the Colusa Company, the pieces as shipped from the quarry being 22 feet 6 inches long, by 4 feet 10 inches square at the bottom and 3 feet 6 inches square at the top. Four others of the same size were shipped to the yard at the same time. F. E. Knowles is president of the company, Abel Hosmer, secretary, and the home office and yards of the company are at Tenth and Division Streets, San Francisco. The quarry of the McGilvray Stone Company is one mile southeast and adjoins the Colusa property on the south. It was opened by the present owners in 1900. The stone has been used in many prominent buildings in San Francisco and some large blocks have been shipped. The office of the company is at 624 Townsend Street San Francisco.

## Why Was Old Mortar So Strong?



WE use comparatively little lime mortar in these days, except for inside finishing, cement having very largely taken its place. This is the more to be regretted because, while most cements badly discolor most stones, unless they are carefully protected with waterproofing at every exposed point, lime mortar will not stain the most delicate stone. There is no reason why good lime mortar should have fallen into disfavor as there are countless examples of its great strength and durability. A. B. Searle has given in the *Building World* of London an interesting study of ancient mortars and their method of preparation. Mr. Searle says: "It is a common saying among older builders and architects that the mortars used many years ago were much stronger than those employed at the present time, and that the mortars employed by the ancient Romans were the strongest which have ever been known. There is much truth in the statement, and it is interesting to see why the ancients could make mortars of a quality which would puzzle some of the most skilful modern builders to reproduce.

"The writer has recently been examining some of these ancient Roman mortars, and has found that they are not made merely of lime and sand, or lime, sand and hair or dung, as are most mortars used at the present time, but that they have different properties and different compositions, according to the nature of the stones they were intended to unite. It is quite certain that the Romans did not use the same mortar throughout a large building, but employed one kind for outside work, another for inside, and quite different mortars for special work, such as the heating flues and chimneys. When the mortar was to be colored or covered with a colored material its composition was as different again; in fact, the ancient Romans must have had a most wonderful knowledge of mortars, judging from tests made of some of their mortars which have survived to the present day.

"Some of the Roman mortars were made of lime of a slightly hydraulic nature, this property being increased by the addition of finely-ground bricks or tiles, especially those which had been insufficiently burned. A typical 'outside mortar,' used by the Romans, consisted of one part of feebly hydraulic lime with three parts of sand and about one-third part of burned brickdust. An equally typical 'inside mortar' consisted of one part of lime to seven parts of sand—a proportion which modern builders would condemn; yet the fact that some of this mortar is today as strong as can be desired shows that the ancient Romans were right.

"Some of the mortars used for the mosaic work appear to have been composed of slaked lime used in a pasty condition without any addition at all; other mortars used for this purpose consist of lime with a little brickdust; but a mixture of sand and lime, such

as that now used by builders for laying hearth tiles was seldom, if ever, used by the Romans. It is the writer's opinion, based on the result of many investigations, that in this respect people have gone backwards instead of forwards, and that it would be well to return more closely to the practice of the ancients in this respect.

"Some time ago a sample of mortar from an old Roman heating stove was sent for examination, and proved to have been made of equal parts of lime and sand, though if the limestone was not pure (and the limestones in the locality are somewhat rich in silica) even a smaller proportion of sand must have been used. So fat a lime appears to us at the present day scarcely suitable for bakehouses and hot-air passages; but its durability is incontestable, for it remains today in as good condition as at first, though the air and warmth have naturally caused it to undergo various slight changes on its surface.

"The one secret which has been lost—apparently for ever—is the means which the ancient Romans employed for gauging the proportions they required to ensure the quality of the mortar they made. That they had some means of deciding this seems evident from the uniformly high quality of their mortars in different parts of the world, and notwithstanding the fact that they used materials of widely differing properties. Such Roman remains as are found in this country supply definite evidence that the mortar was made from local limestone in each case, yet how the Romans knew what proportions of sand or brickdust to add to these different kinds of lime is a mystery.

"Possibly they had some method of calculation based on the density of the lime when made into a paste, or they may have determined the amount of space between the grains of sand and adjusted the quantity of lime accordingly. It is idle, however, to guess how they obtained such excellent results.

"The uniformity of the quality of the mortars made by the ancient Romans is a striking characteristic which appeals instantly to anyone who is called upon to examine them, either for archaeological or other purposes. This uniformity must be the result of a high degree of knowledge, for the modern mortars are seldom so uniform, even when they have been ground in a mechanically-driven mill, whereas the Roman mortars were all made by the use of a sort of rake or hoe, which was employed to turn the materials over and over until they were uniformly mixed.

"The characteristics of the old Roman mortar may have been partly due to the way in which it was prepared; it was the invariable custom—as far as it is possible to ascertain this—to slake the lime with such a proportion of water as would form a smooth working paste, stiff enough to support a small animal, such as

a cat, which might walk across it. The lime-pits used by present-day plasterers are probably similar to those used by the Romans in the preparation of their paste. To the paste thus prepared the sand or brickdust was added in a proportion which evidently depended on the nature of the lime paste and on the work of the mortar was supposed to do. Where a particularly hard mortar was required brickdust was preferred to sand, as it combines more extensively with the lime and forms a more waterproof mortar. As the brickdust was costly and took a long time to select and grind to the very fine powdered form in which it was used, some sand was often substituted as a cheap diluent, but the best work was done with very little sand. The Romans seem to have been adepts at the use of lime paste without any addition at all, and to have found this remarkably useful as a cement for interior walls and mosaic.

"If modern mortar is to be as strong and durable as that made by the ancient Romans, it is clear that builders will have to study the scientific side of the subject with more care than they have done. This is awkward, for the scientific study of mortars is one of the most difficult branches of knowledge, and it is a field wherein few have yet worked on systematic lines. Innumerable trials are slowly teaching us more and more of what the Romans seem to have regarded as commonplace knowledge, and in time it may be possible to know still more of the methods they used. Meanwhile, builders will find that the use of brickdust is of greater value in mortar than they may suppose it to be at the first attempt, but it must be made from loamy bricks which are underburned, and not from the hard, dense, shale bricks of the Midlands."

### Utilization of Feldspar

Feldspar is used in large quantities in both the body and the glaze of pottery and tile and in the manufacture of enameled ware. Considerable feldspar is used also in the manufacture of abrasive materials, particularly scouring soaps, and feldspar of inferior grade is used in making ready roofing material and as chicken grits. Some feldspars are potash bearing, and efforts have therefore been made to use them as fertilizer, but thus far without commercial success. Efforts to treat feldspars in order to make the potash in them more soluble, or at least more readily available as plant food, give some promise of success, and small amounts have been so used during the last year, most of the feldspar so treated having been added to so-called complete fertilizers.

The production in 1915, according to Frank J. Katz, of the United States Geological Survey, amounted to 113,769 short tons, valued at \$629,356, which, though a decrease of 16 per cent. in quantity and a very slight decrease in value as compared with 1914, is a much greater value than in former years. The prices paid for feldspar in 1915 were about the same as in recent

preceding years, averaging about \$3.50 per long ton for crude material of pottery grade and about \$8.33 per short ton for ground material for pottery. Better grades of ground material brought \$10.50 to \$11 per short ton. Maine ranked first in quantity and value of its output, and all feldspar shipped from that State was of high grade. North Carolina, New York, Pennsylvania, Connecticut, Maryland, California, New Hampshire, and Virginia were also producers in relative quantities indicated by the order in which the States are named.

In a bulletin on "The Feldspars of the New England and North Appalachian States," just issued by the United States Bureau of Mines, the author, A. S. Watts, says: "The Bureau of Mines has been conducting an investigation of the feldspar resources of the New England and North Appalachian States with a view to greater efficiency and economy in their utilization. Such an investigation was deemed necessary, not only because of the continued and increasing consumption of these minerals, but especially because of the demand for better technical control of the raw materials that are used by the white-ware industries of the United States. Most manufacturers of white pottery wares have only a limited knowledge of the origin, mode of occurrence, and methods of mining and preparation of the materials that they use.

"Heretofore, owing to a belief that the supply of raw material was unlimited, the manufacturer had concerned himself chiefly with the solution of the problems of manufacture. Within the past few years, however, it has been found that difficulties arise in manufacture which can be traced beyond the manufacturing process and are believed to be due to a need of better control of the materials used. Furthermore, as competition becomes more severe, more attention must be paid to selection of materials in order to minimize consumption and also to avoid unnecessary expense for transportation of material.

"Doubtless the lack of interest as regards these details has arisen from the fact that in the past a considerable proportion of the white-ware ingredients has been imported and the manufacturer has been forced to rely on the samples submitted and the general uniformity of the source of supply to insure against variation of the material. An extra precaution arising from this lack of definite knowledge still prevails in the common practice of never depending on one source of supply for any one ingredient. Often the products of three or more producers are blended so that if any one shall vary without warning the variation arising from its use will not be sufficient to ruin the ware.

"As the use of domestic materials has increased, the manufacturer has generally depended on the results of tests of samples submitted. The crude materials differ so greatly from the materials purchased, and the treatment necessary to prepare crude material for

use involves such an intimate acquaintance with its peculiarities that the users had further cause to neglect to acquaint themselves with the details of its mining and preparation.

"The investigations presented in this bulletin have been undertaken by the bureau with a view to a better understanding of the conditions which confront the producer of commercial feldspar and also with the object of determining wherein the various deposits of feldspar differ. This information will enable the manufacturer to choose the source of supply which is best suited to his needs, and in case a change is necessary to choose more intelligently the location from which to draw for his future supply."

### **The War's Effect on Italy's Stone Trade**

Mention has been made several times in these columns of the effect of the European War on the quarrying and stone working industry of the Carrara district. But the effect is shown in other parts of Italy, according to a report by Consul B. Harvey Carroll, Jr. at Venice. The exportation to the United States of carved marble and stone from that port fell from \$56,302 in 1914 to \$703 in 1915. The exportation of stone and marble in the rough from the same port to the United States dropped from \$12,456 in 1914 to \$3,820 in 1915. Consul F. F. Dumont writes from Florence that workers in alabaster had a most unsatisfactory year, the United States affording the only foreign market. The heavy increase in the shipments of antiquities resulted from the lack of market in Italy. Dealers finding themselves in a bad situation went with their stocks to the United States and disposed of them there at reduced prices.

### **Granites and Sandstones of Texas**

The latest bulletin issued by the Bureau of Economic Geology and Technology of Texas is devoted to the mineral resources of that State and is by Dr. Wm. B. Phillips. In speaking of the granites of the State Dr. Phillips says there are many beautiful varieties and that the deposits are large. The stone used in the capitol is a coarse-grained red granite, but there are also many excellent quarries of light and dark gray, bluish gray and reddish gray. Then so-called opal-granite of Llano county (llanite) is really a quartz porphyry. It is of a reddish brown color, and carries many inclusions of opaline quartz, which gives it a strikingly handsome appearance. It has not been utilized, although the belt of country in Llano county to which it belongs is of easy access. It is a very hard stone and takes a fine polish. Although Texas has many varieties of sandstone there has not been a large output of this stone. Excellent sandstones occur in many counties, especially in Bexar, Burnett, Fayette, Lampasas, Lavaca, Tyler, Ward, etc. Most of the stone is of a clear gray color, but in Ward county, near Barstow, there is a good quarry of a reddish-brown

stone that has been used to a considerable extent. One of the latest buildings to employ this stone is the addition to the Bexar county courthouse, San Antonio.

One of the best gray sandstones in the State occurs on both sides of the Colorado river at Chaddick's Mill, Lampasas county. This locality has afforded stone for local use, but now that the San Saba Branch of the Gulf, Colorado & Santa Fe Railway crosses the river immediately contiguous to some of the most favorable deposits, it would appear that this stone could come into more extensive use. Dr. Phillips says that in San Saba county there are deposits of reddish, dove-colored and whitish marble taking a fine polish and also a beautiful silver-black and golden onyx. The latter stones are unequalled in attractiveness for interior ornamental purposes.

### **The Mount Airy Granite Industry**

A sketch was given recently in a Southern paper of the great granite industry that has been built up at Mount Airy, North Carolina. The deposit is vast in extent and possibly a mountain, of which the stone constitutes a slope to a deep valley below, is all granite at a certain depth below the top of the mountain. At any rate the granite surface that is totally eroded of all overlay of any kind presents a bold rock surface upon which one can drive for a mile. Immense columns and slabs a hundred feet in length can be cut from the solid granite ledges, into which the quarrymen have hewn their way.

The Mount Airy quarry is owned by the North Carolina Granite Corporation which holds 150 acres comprising the light gray granite quarry, from which four independent granite concerns at Mount Airy procure their raw material. The industry is one of great magnitude, last year's output of stone having approximated \$700,000 in value. The total investment of the companies is \$600,000, which includes the land, buildings and equipments. The quarry has been operated almost steadily since 1889 but never on the large scale of present operations. The owning company quarries the stone while four finishing concerns turn the product into mausoleums, monuments, markers, and building materials, cut to specifications, ready to be laid by contractors. The immediate quarry covers forty acres and Mr. J. D. Sargent, president of one of the finishing firms, says the supply is equally as large, though not so spectacular, as the immense pile which constitutes the famous Stone Mountain in Georgia.

The quarry corporation itself supplies paving blocks and crushed stone direct to the consumer. Last year more than 250,000 paving blocks and curbing were sold, and the combined shipments of the quarry corporation and the cutters required last year the use of 3,500 to 4,000 railroad cars. From 300 to 700 men are employed in the quarry during the different stages of the work, at different seasons of the year.

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A PECULIAR legal case is reported from a western state. There is a big lime and quarrying corporation which has been carried on under a firm name. Through oversight or neglect the State corporation license tax was not paid within the time prescribed by law, and its charter was automatically forfeited. When the officials discovered this predicament they tendered the amount of the tax and interest to the State Treasurer. But they were informed that the money could not be accepted as the company had no legal existence. What was more, the firm name of the company had been appropriated by a newly organized concern with a paid up capital of \$30. Inasmuch as there is no one connected with the new company whose name even remotely resembles the firm name of the old concern, the object of this assumption of the title is not quite apparent. The old company is confronted with the possibility of a lawsuit to regain the use of its own name.

A NORTH CAROLINA newspaper, in calling attention to a published account of the great granite industry of that State, makes this pregnant comment: "It seems to be a fact that other States make larger drafts on the granite quarries of North Carolina than does our own State." In this connection it may be noted that a Maine newspaper seeks to find a reason for the failure of a great concern in that State, and is inclined to attribute it to the difficulties and expense of long distance transportation to markets in other States. It does not speak of the lack of demand for the granite in Maine building work, although we are inclined to believe that the proportion of the quarry output used in that State is entirely negligible. All over the country newspapers are very free in their condemnation of the United States government because it will not discriminate in favor of local stone in the erection of Federal build-

ings. If, instead of demanding that Uncle Sam should pay more than the current market price for building materials, the newspapers would unite in urging the citizens of their States to make freer use of native stone they would accomplish far more in the upbuilding of the quarrying industry.

A LEGAL case of general interest to the stone trade has been decided by the United States Court of Appeals. Suit was brought by a marble company against a builder. The court ruled as follows: "The plaintiff contracted to do certain building work for the defendant, agreeing to commence at once and prosecute the work to completion with all possible dispatch, and to furnish a sufficiency of labor and of skilled mechanics when it was possible to proceed. The defendant agreed to make payments on monthly estimates. During the second month of the work the plaintiff was notified to stop, as a reorganization of the defendant company was contemplated. Estimates were given, but no payments were made on account of the work done. The court held, that whether, or not, such notice to stop work indefinitely constituted an absolute and unequivocal renunciation of the contract and entitled plaintiff to maintain an action at once for the breach was a question for the jury."

A DETERMINED effort is being made in a certain part of the country to promote the use of a native stone, of course at the expense of the Federal Government. The usual charge is made that the Treasury Department discriminates against it, when what is really meant is that the department refuses to discriminate in favor of it by paying a higher price than is demanded for competing stone of equal if not higher grade. The lack of exact knowledge that is generally back of such movements is well illustrated in this instance by the fact that one of the newspapers that is most insistent in voicing its demands repeatedly refers to the stone as a granite, whereas it indisputably is a sandstone. In this connection we cannot refrain from quoting from a letter written to some of his constituents by a congressman who had been working for native stone in a new post office in his district. He has constantly held out for native materials, he writes: "but the supervising architect informs me that it is not the policy of his office to favor local materials in the construction of government buildings. I quite agree with you that we have plenty of stone quarries in — that could turn out proper kind of building stone, but the supervising architect will not favor our materials, and it is a foregone conclusion that the stone used will come from Indiana. I recognize the injustice of this, both to the capital that is invested in — and to stonecutters and all other laborers who reside there. The attitude of the supervising architect in this matter is not subject to review or change by congress, and he, therefore, makes such specifications as he deems best. It is not

my purpose to engage in any undue criticism of any government official, but it seems to me that in the construction of buildings in a given community, local materials should be given a preference." One cannot but think that there is a surprising lack of frankness in this letter. There is not one word on the important subject of price. The policy of "not favoring local materials" simply means that the supervising architect has no right to "favor any native stone" by paying an exorbitant price for it, even if this would foster a local industry. The Treasury Department has always shown a willingness to use any stone of good appearance that will pass the necessary tests, providing it is offered at a price that is not greater than that of competing stones. Much of the congressional utterance on this topic is what Americans most expressively term "buncombe."

### Delay in the Court House

Comment has been made in these columns on the delay in building New York's new court house. First there was trouble over the site, and then objection was raised that the plans provided for the erection of altogether too costly a building. There has been tinkering over the design and the specifications, all in the way of "economy," it is claimed. Of course the most important change was in the suggestion to use artificial stone in various parts of the structure. That is to be expected whenever the politicians take a part in building operations. New Yorkers seem to be growing rather restive because of the failure to begin work, especially as certain heavy expenses are continuing. The *Times* has the following editorial:

"The continued delay in beginning the building of the new Court House is amazing. It was announced that the Board of Estimate would authorize the work at its meeting on May 19, but June is upon us and the tract north of the Municipal Building is still a forlorn waste. The cost of the building has been reduced, gradually, from the \$15,000,000 which would have been required by Mr. Lowell's first plans to \$10,000,000, and now to \$7,500,000, or half of the original estimate. It cannot be further reduced if the new building of the Law Courts is to be worthy of the city. The present interest charges upon the land held by the city amount to nearly \$500,000 a year, much more than \$1,000 daily, and to this large sum should be added the loss of taxes on the buildings taken over by the city and the land it has acquired. A part of this land is to be sold, and when the improvements are begun it should bring fully \$3,000,000, and thus reduce the cost of the site to about \$8,500,000. But clearly no sale can be made while the work of building is delayed, and the burden of expense entailed by the failure to begin operations threatens to equal the money to be saved by reducing the cost.

"The procrastination in carrying out the plans for the Court House since the site has been selected is equaled in our municipal history only by the procrasti-

nation in selecting a site and obtaining plans. Precious years were wasted in this work, and the waste of days, months, and years continues. Both the site and the plans are the best that could be obtained. The location is central and will be convenient to the lawyers. The building of the new Law Courts will result in the reclamation of a neighborhood that has been sadly neglected for many years. The value of the improvement to the city will be incalculable. Yet, after two years of pottering over the estimates, and a radical reduction in the cost which should satisfy the most economical mind, the Court House project is still merely a project. A few buildings have been razed, making the neighborhood more unsightly than the neglect of two generations had made it. The order to begin building seems to have been laid on the table. What is the new reason for delay?"

THERE is considerable complaint of a lack of activity in the building field, some of which, unfortunately, is justified. But much of the talk is based upon mere impressions, and has no sure foundation. A summary of the report of labor conditions and building operations for April, issued by the New York State Labor Bureau, is given in another column, and it is far from discouraging. It is true that permits for new buildings were issued in the ten first and second class cities to the value of only \$17,948,982 in April, as compared with \$20,561,573 in April, 1915. Nevertheless this was a good healthy advance over March, 1916, when the amount was only \$15,825,190. As far as the industry which this magazine represents is concerned, the borough of Manhattan is, of course, the most important, not only because the total operations are of great magnitude, but also because the class of buildings erected is apt to make use of a larger proportion of stone. The permits for the erection of new buildings in this borough for the month of April last aggregated no less than \$7,028,700. The amount for April one year ago was only \$5,834,740. Another indication of increased activity is shown by the fact that the percentage of members of the stoneworking unions reported idle in April, 1916, was 39.1, as compared with 59.5 per cent. for the same period in 1915, and 57.5 per cent. for April, 1914. Last month we had reports from important centers in various parts of the country, and almost without exception they showed a steady increase in building activity. To the close observer of the entire field it would seem as if the depression in the stone industry, concerning which there is complaint in some quarters, was due less to a lack of building work than to an unwise cutting of prices. Unless work is taken at a fair margin of profit, the mere multiplicity of orders counts for little.

### Building in New York State

The report of the condition of the labor market in April, as issued by the Industrial Commission of the New

York State Department of Labor, shows that during that month in this state the number of men employed was 21 per cent. greater and the wages paid were 37 per cent. greater than one year ago. There was also a 3 per cent. increase in employees and 5 per cent. in wages in April over March. The stone, clay and glass products group, which are thus classified together in the report, showed a gain of approximately one-tenth. The stone, clay and glass products group employed 12 per cent. more operatives and paid 10 per cent. more wages in April than in March. This increase was largely seasonal; the greatest improvement in the group between March and April was in the brick, tile and pottery industry. Important increases were recorded also by the miscellaneous stone and mineral products industry and by the lime, cement and plaster industry.

In the building trades for 59 unions with about 32,000 members the percentage of idleness for April 15 was 27.5 as compared with similar figures for 1915 of 41.2 per cent., for 1914 of 40.2 per cent., and for 1913 of 19.6 per cent.

In the ten first and second class cities of the state the estimated cost of building work (both new buildings and repairs) for which permits were issued in April was \$21,177,931, an increase of 4 per cent. over the figures for March, but a decrease of 7.6 per cent. as compared with April of last year. Every city showed an increase (and except Binghamton a heavy increase) for April over March outside of Buffalo and New York, in the former of which there was a decrease of 10.7 per cent. while in the metropolis the decrease was 4.4. On the other hand, all the cities except Albany, Binghamton, Syracuse and Yonkers, contributed to the decrease in April between this year and last above noted for all cities combined.

Although New York City showed a decrease of 4.9 per cent. in building in April compared with a year ago, the Borough of Manhattan showed a gain of 24.3. The percentage of increase in Albany was 51.3; in Binghamton, 7.5; in Syracuse, 15.1, and in Yonkers 10.2 per cent.

### Record Production of Fluorspar

The production of fluorspar in the United States in 1915 represented an increase of more than 20,000 tons, or nearly 18 per cent. over 1912, which was the next highest year. Sales of fluorspar in 1915 were reported from five states—Illinois, Kentucky, New Hampshire, New Mexico, and Colorado. All showed increases over 1914 except Colorado, where there was a large proportional decrease, the United States Geological Survey reports.

Fluorspar mined and marketed in the United States in 1915 yielded a total of 136,941 short tons, valued at \$764,475, compared with 95,116 short tons, valued at \$570,041 in 1914. As usual the bulk of the fluorspar produced was sold as gravel spar, the quantity in 1915

amounting to 114,151 short tons, or 83 per cent. of the total. The Survey, in a statement on the subject, says: "Notwithstanding that the prices of many mineral products, including steel (the production of which practically controls the fluorspar output) increased during 1915, the value of fluorspar declined. The average price per ton for the whole country, considering all grades of fluorspar, was approximately \$5.58 in 1915, as compared with \$5.99 in 1914, a decrease of 41 cents a ton. In 1912, although the output was about 200,000 tons less than in 1915, the value of the product was \$4,688 more than in 1915. This decline in value has been caused largely by improvements in methods of milling and handling larger quantities of spar in the Illinois-Kentucky district. The decline in price from 1914 to 1915, however, has greater significance. The demand for spar was unusually good and the competition from foreign spar very light, so that conditions were favorable for high prices. Some fluorspar may have been sold on contracts at low prices a long time in advance, but it is also believed that the large producers voluntarily kept the price down to a small margin of profit in order to produce and hold for domestic spar eastern markets which have formerly been supplied largely by imported spar. The imports of fluorspar have been steadily declining for a number of years.

### Big Production of Talc

The United States has long been the leading nation in the production of talc and soapstone, and its production of late is increasing. The output of talc for 1915 was 166,336 short tons, valued at \$1,401,197, and of soapstone 20,555 short tons, valued at \$490,385, according to J. S. Diller, of the U. S. Geological Survey.

The best grades of talc, which are used in the manufacture of pencils, crayons, and gas tips, as well as of toilet powder, though found in North Carolina and Georgia, are not supplied there in sufficient abundance to meet fully the American demand.

Talc is most extensively used for making paper, paints, and lubricants, and the bulk of the supply comes from New York and Vermont. Pennsylvania, New Jersey, and the Southern States contribute largely to the talc used in the manufacture of toilet powders, paints, soaps, and lubricants, and in the rubber trade as well as in finishing leather. Talc of the lowest grades, much of it discolored, is used for foundry facings in casting iron. It is soft and slippery and is widely used to diminish friction.

### A Bequest by Harry Hems

By the will of Mr. Harry Hems, the well-known ecclesiastical art worker and sculptor of Exeter, he bequeathed a rood beam worked by himself to be erected in St. Sidwell's Church, Exeter. The rood,



which has upon it a figure of Christ on the Cross and two flanking figures of saints, all said to be more than life size, was twice offered to the church by Mr. Hems in his lifetime, and on each occasion, after considerable discussion, the offer was declined by the vestry. At a recent meeting of the vestry the acceptance of Mr. Hems's bequest was discussed, and it was decided by 15 votes to 4 to apply for a faculty for the erection of the rood in the church, but it is probable that the application will be opposed step by step by those who hope to prevent its erection.

### New Companies

The James Limestone Company, Inc., of Lynchburg, Va., to quarry and deal in limestone. Capital, \$50,000. James R. Ford, president; James L. Martin, secretary—both of Lynchburg, Va.

The Frontier Sand & Gravel Corporation, of North Tonawanda, N. Y., to quarry and deal in sand, gravel, etc. Capital, \$10,000. Incorporators, F. F. Baker, W. Allen, F. W. Ives, 156 Oliver Street, North Tonawanda, N. Y.

The John La Spina Stone Company, Inc., of New York City, to quarry and deal in stone, slate, marble, etc. Capital, \$5,000. Incorporators, C. Lott, S. and J. La Spina, 440 East 108th Street, New York.

Bull & Wilbur, Inc., of Otisville, N. Y., to deal in stone, sand, etc. Capital, \$30,000. Incorporators, F. H. Finn, J. L. Wilbur, G. R. Bull, Bloomingburg.

Cumberland Crushed Stone and Gravel Company, of Portland, Me., to quarry and deal in stone, etc. Capital, \$50,000. Incorporators, E. E. Huston, M. F. Day and E. V. Mann, Portland, Me.

Barre Monument Company, of Chicago, to manufacture and deal in marble and granite. Capital \$2,500. Incorporators, E. A. Twohey, George W. Curtis and Joseph Orrico.

The Champlain Valley Lime Corporation, of Colchester, Vt., to quarry and manufacture lime, etc. Capital, \$10,000. Incorporators, N. J. Crandall, Jonesville; W. A. Griffith, Burlington; C. E. Ralph, Colchester.

The Sierra Slate Corporation, of New York City, to quarry slate, operate mines, etc. Capital, \$3,000. Incorporators, J. T. Grieve, R. A. Sanborn, E. W. Campbell, 4 White Street.

The Pulaski Stone & Construction Company, of Little Rock, Ark., to quarry and crush stone, etc. Capital, \$10,000. Incorporators, E. N. Weigel, J. H. and M. V. Parkin and W. B. Weigel.

The Easton Stone Company, of Greenwich, N. Y., to quarry and manufacture building stone. Capital, \$5,000. Directors, Harry C. Gray, John W. Bright, Howard W. Leing and I. V. H. Hill, all of Greenwich.

The Stone & Art Tile Company, of 757 Montgomery Street, Jersey City, N. J., to manufacture and deal in monuments, mausoleums, etc. Capital, \$50,000. Incorporators, Walter J. Gorman, William Gorman, Martin V. Ryerson, William Ritchie, all of Jersey City.

The American Green Granite Company, Inc., of Barre, Vt., to do a retail granite business. Capital, \$5,000. Incorporators, Waldron Shield and Earle R. Davis, of Barre, and Simeon Garand, of Montpelier.

The Carmichael Gravel Company, of Williamsport, Ind., has increased its capital stock from \$50,000 to \$150,000.

### Quarry Notes

It was announced some time ago that owing to a lack of sufficient orders it was possible that the Green Quarry at Sturgeon Bay, Wis., would not be operated the coming season. So

many orders have been secured, however, that it is now believed the season will be an unusually heavy one. The company is endeavoring to secure one hundred laborers, and it will probably charter a tug and secure another stone barge.

W. G. Wheelihan, of the Necedah Stone Company, Necedah, Wis., has been rebuilding a stone crushing plant, installing new boilers, crusher and equipment. The plant has now begun operations.

The city of Marquette, Mich., has purchased land in South Marquette, which will be used for quarry purposes. The stone on the property has been tested and is declared excellent for road building purposes.

The recently organized Pulaski Stone & Construction Company, of Little Rock, Ark., has installed a rock crushing plant on the Pinnacle Road, near the Little Rock Country Club. This is operated by electricity and will have a capacity of 1,000

### THE ABBEY CHURCH OF PLAMPED

An interesting Eleventh Century structure, from a sketch by J. Tavenor Perry in the *London Architect*

cubic yards a day. It will employ fifty men when operated at full capacity.

J. T. Vaughan and Martha Vaughan are suing the Universal Crushed Stone Company, of Racine, Wis., for the lands which the latter now occupy for quarries at Ives, Wis. They claim that the lands were never lawfully transferred. John Vaughan, the original owner, died in 1877 and the lands were sold by order of the court in 1879. The case is said to involve several million dollars' worth of property.

The common council of Minneapolis, Minn., which has received complaints with regard to blasts fired by quarrying companies within the city limits, has decided to give the Minneapolis and the Minnesota Crushed Stone companies, operating quarries in Northeast Minneapolis, three weeks in which to try the effectiveness of smaller quantities of dynamite than heretofore used in blasting, before a specified amount should be fixed by ordinance.

The town of Wilna, N. Y., has established a new stone crushing plant to replace the old one, which was worn out.



# The Laying-out of Stonework—Part XIV

By D. T. PATTERSON, *Edinburgh*

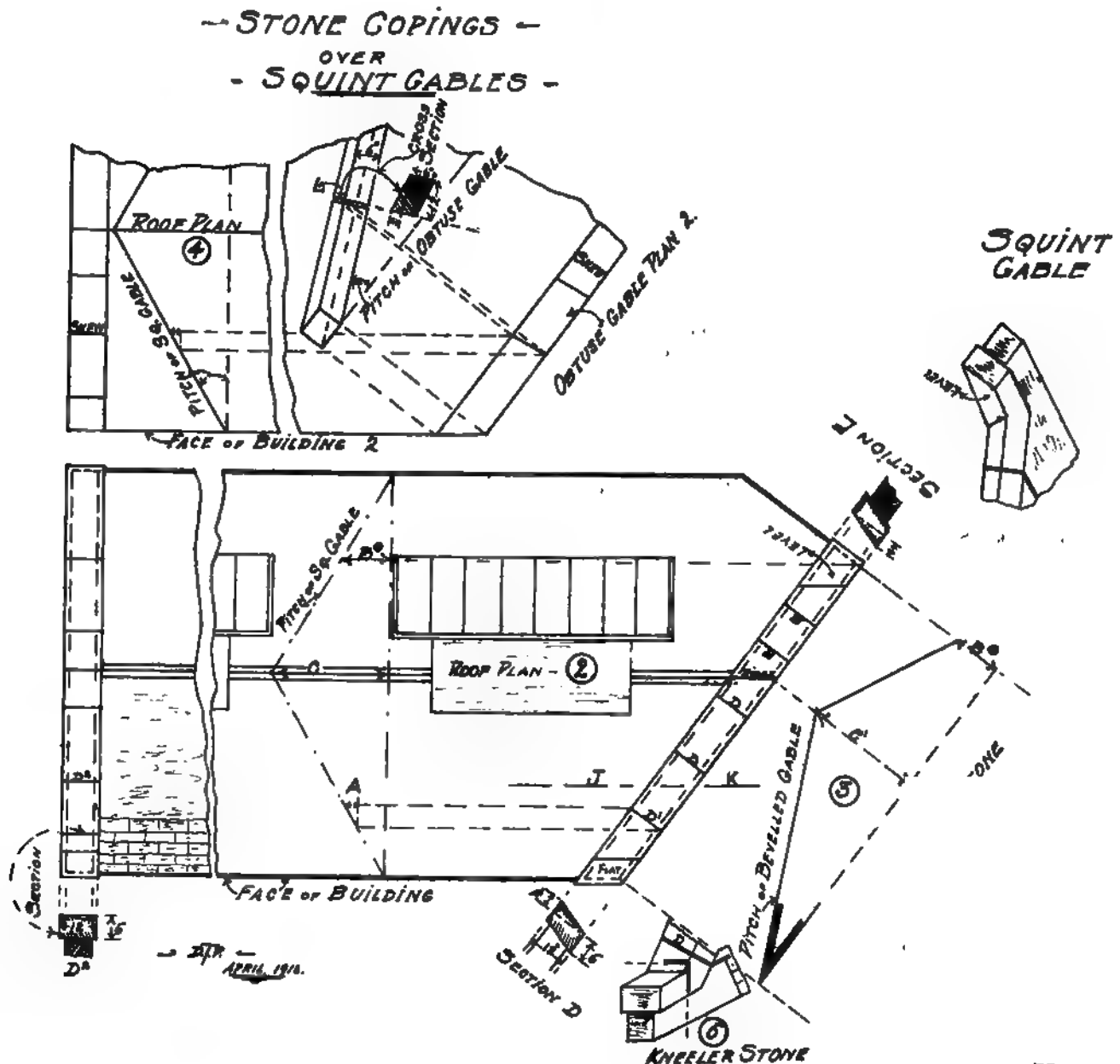
FIG. 1 shows the elevation of a building with square gable on the left-hand side, and a squint or obtuse angled gable on the right-hand side. Presuming the roof of this building to be a span roof with the ridge in the center and of equal inclination, the top surface of the skew or coping on both gables ought to be in the same plane, that is to say, if we stretch a line across the copings as line H to I, the upper surface to skews ought to "take the line." A rectangular cross section skew, however, if built on gable I would not do so. To find the correct shape of cross section here required: Lay out the portion of roof plan required, Fig. 2, marking off width of skew on plan, draw in cross joints of skews as D', etc., and project to cut rafter line on pitch of square gable at A, take distance of vertical height there indicated and transfer same to A' at section D, marking off from dotted cross line, which is at right angles to the perpendicular side of coping

and complete the rhomboidal cross section shown, which will conform to square section D<sup>2</sup> when built. The pitch of beveled gable will of necessity be flatter than that of square gable, and this is exemplified at Fig. 3, where the vertical height C' equals C at pitch of square gable, therefore the inclined bevel necessary for the working of kneeler stone 5 is obtained from Fig. 3.

A point that should be borne in mind is that an obtuse angle gable requires an obtuse angle skew, and an acute angle gable an acute angle skew. The above references refer to the top side and outer edge of skews on cross section.

Before leaving Fig. 2, I should now state that while I have shown the cross joints of skew at D', D, D, etc., on plan to be square from edge, strictly speaking, that is not correct. The top surface of skews on any line such as H I, Fig. 1, or J K, roof plan 2, are in horizontal planes, but the cross joints D', D,

①



etc., form obtuse angles on cross section and are therefore on inclined planes, thus causing the lines here drawn to be in the perspective, although on the actual stone this joint line is perfectly square from edge of skew. On roof plan, Fig. 4, I have set out the strictly true geometrical method. To set out this, proceed as follows: Lay out plan as before, set out square cross section of roof. Next project elevation and pitch of obtuse angle gable (within plan as shown), showing coping, or skew in perspective, draw one joint at will as shown at L, drop the two ordinates from top, cutting lines of joint to cut outer and inner edges of skew on plan as shown, and draw line across which gives the difference referred to. From this point proceed as before described. The difference between cross sections obtained in the first and second instances are infinitesimal, and the draughtsman who adopts the simple and expeditious method set forth in Fig. 1 has nothing to fear so far as the fitting together of the resultant work is concerned.

The reader should again bear in mind that the joints on the actual stones of the squint work are perfectly square across from the outer or inner edge precisely as with the skew joints of square gable D<sup>2</sup>.

The annexed rough sketches of kneelers and apex stones should prove useful to budding stone draughtsmen.

### Business Brevities

The George Wolf Company, of Appleton, Wis., has changed its name to the Appleton Marble & Granite Works and has increased its capital stock from \$25,000 to \$50,000. George Wolf is president and E. B. Rachow, secretary.

The Secretary of War has chosen C. H. Niehaus as sculptor and E. V. Warren, of Brooklyn, as architect to erect the \$75,000 statue to Francis Scott Key, author of "The Star Spangled Banner," at Fort Henry Reservation, Baltimore, Md.

The committee in charge of the erection of a Mormon Battalion Monument in Salt Lake City, Utah, will shortly select the site for the monument on the Capitol grounds.

J. Leonard Boynton has been selected as designer, and Hugo Gari Wagner as sculptor, of the proposed monument to Spanish War heroes to be erected on the courthouse square at Binghamton, N. Y.

The women of Boise, Idaho, have raised a sum of money for the erection of a monument to the dead Union soldiers of Idaho in Morris Hill Cemetery, Boise. There are 218 veterans buried in the Military Cemetery in that city.

The Markle Stone & Lime Company, of Indianapolis, Ind., has increased its capital stock from \$25,000 to \$50,000.

During the past month a fire of incendiary origin damaged the Rose City Marble Works at New Castle, Ind.

At the annual convention of the National Mausoleum Association, held in St. Louis, the following officers were elected: A. M. John, of the Valhalla Mausoleum Company, president; H. D. Connor, of the Roseville Mausoleum Company, vice-president; F. H. Perry, of Baltimore, Md., secretary; M. J. Copeland, general manager of the Western Mausoleum Company, of Moline, Ill., treasurer.

A public monument has been erected in the Spring Forest Cemetery, Binghamton, N. Y., to the twenty-one unidentified dead who perished in the Binghamton Clothing Company fire, nearly three years ago. It is expected that the monument will be dedicated during the coming month.

A movement is on foot to erect a monument in Missouri, his native state, to William Gilpin, who became the first territorial governor of Colorado. He and his wife gave to the Sisters of Charity of Leavenworth the ground on which St. Joseph's Hospital stands.

The Interstate Commerce Commission has declared that the rates of fifteen and seventeen cents per cwt. charged by the Chicago, Great Western and connecting railroads on building

stone in carloads from St. Paul, Minn., to Kansas City, Mo., are unreasonable to the extent that they exceed 12 cents per cwt.

### Notes from the Stone Fields

#### MARBLE AND GRANITE

The officers of the Portland Mausoleum Company have given to Parker & Banfield, of Portland, Ore., the contract for the erection of a \$50,000 mausoleum that is to be built adjoining the Riverview Cemetery in that city. The exterior of the building will be of granite and the interior finish of

#### NORTH AISLE, ABBEY CHURCH OF PLAMPED

Early stonework of an 11th Century church at a town on the River Cher in France

marble, with terrazzo floors. The plans were prepared by Lawrence & Holford, of Portland.

H. L. Sitherwood and Harry Kearns have discovered a new kind of marble in great quantity at Livingston, Mont. Because of its strong resemblance to that variety of wood, it is called mahogany marble. The claim lies three and one-half miles southeast of Livingston on sectional lines and is connected by a good road. The tract consists of two hundred acres and accompanying the marble are said to be big deposits of red and yellow ochre, in addition to considerable onyx. No effort has thus far been made to ascertain the depth of the marble formation. Samples taken from the surface and sent to Denver took a remarkably good polish for surface stone.

The Grand Rapids Marble and Fireplace Company has been awarded the contract for the marble work in the Waterman gymnasium at Ann Arbor, Mich.

A blast was fired in the Little Cottonwood quarries of the Utah Consolidated Stone Company recently in order to bring down stone to be worked during the coming season. No less than 7,500 pounds of black powder was exploded in a shaft 65 feet deep, from which ran crosscuts 15 feet each way. The

blast brought down thousands of tons of granite, the masses of stone being from 20 to 100 feet through. The work was recorded by a motion picture camera and it is expected that the films will be shown throughout the country.

A number of patriotic organizations of Newark, N. J., have erected a granite seat in Military Park in that city opposite the new Robert Treat Hotel, to mark the "Training Place" established in 1669. At the unveiling of the memorial an address was made by Secretary of War Baker.

After a strike lasting a number of weeks, the trouble between the paving cutters and the quarry operators at Vinalhaven, Maine, has been settled by the signing of a new bill of prices. This gives the men an advance in wages of from four

models of post offices being built in the smaller cities of the country.

William Bryant, for many years an expert quarryman at Lee, Mass., opened a quarry for the Hudson Granite Company on the Lee and Huntington trolley line. A new siding has been built into the quarries and improved machinery is being set up. The force of men will be increased, as soon as the accommodations can be provided for them. The granite is said to be of superior quality and owing to the nature of the formation is easy of extraction.

The Sons of the American Revolution have erected a monument over the grave of the Rev. Alexander MacWhorter in the churchyard of the First Presbyterian Church, at Newark, N. J. The Reverend Dr. MacWhorter, who was an ardent patriot of the American Revolution, died in 1807, but his grave has not been marked until the present time.

The contract for the marble work in the new University of Washington has been awarded to the Art Marble Company, of Seattle, Wash. The total cost of the building will be about \$200,000. The proposition has been submitted for the erection of a State Armory on the University's campus.

Barre granite is specified for the soldiers and sailors monument to be erected in Atlantic City this summer. The stone will be taken from the quarry of the Barre Granite and Quarry Company, and will be cut by Canton Bros., for O. J. Hammell & Company, of Pleasantville, N. J.

The last of the labor difficulties in the Maine granite district was settled the latter part of May, when the St. George Granite Company signed a five-year agreement with its striking paving-cutters, giving them an average increase of 10 per cent. in pay. About 150 men are affected.

#### LIMESTONE AND SANDSTONE

The New York State Board of Claims awarded \$76,000 to the Orleans County Quarry Company, for 7.3 acres of quarry land, appropriated for barge canal uses, basing the allowance on a valuation of .2 cents per cubic foot for uncovered stock in the parcels of land taken. The Appellate Court says the award is excessive and intimates that the valuation should be based on the average taken at about \$1,000 per acre as quarry lands are always bought by the acre and not by the uncovered amount of stone they contain. This makes a difference of nearly \$70,000 in the two valuations of the property.

The work of construction on the new high school at Brockton, Mass., was delayed for several weeks because of the freight embargo on stone. The stone has now arrived and the construction work is being pushed.

The Boise Stone Company, of Boise, Idaho, has been awarded the contract to furnish the stone for the new \$75,000 Federal building at Ellensburg, Wash. The stone will be shipped from the quarries located on Table Rock, Idaho.

No decision has yet been reached as to the location of the new lime grinding plant in Virginia, for which an appropriation of \$25,000 was made at the recent session of the legislature. The governor of the State, the commissioner of agriculture and the superintendent of the penitentiary are to select the site, which is to be somewhere in Tidewater, Virginia.

The Southern Limestone Company, engaged in quarry operations at Kellers, near Martinsburg, West Virginia, is erecting a lodging house and mess hall for its many employees.

Floyd county, Iowa, is discussing the establishment of a lime-grinding plant. A proposition is made to have a portable crushing plant that can be moved to various quarters as the demand for the material arises.

The Catholic Church of St. Martin of Tours, at Knickerbocker Avenue and Weirfield Street, Brooklyn, has just been dedicated. The church is of Romanesque design and is built of limestone and granite. The latter stone has been used

#### SOUTH AISLE, CHURCH OF EAST MEON, ENGLAND

Early Norman stone-work showing arches and piers and also an early timber roof. A well preserved example of 11th Century work.

to sixteen cents and the new scale will run from four to five years. It is said that this is the first disagreement between the paving cutters and their employers for more than 24 years.

V. E. Lindsay, who has been in the monument business in Phoenix, Arizona, for the past six years and who formerly owned the Salt River Valley Monumental Works, has become the general manager of the Arizona Granite Company, with quarries and shops at Prescott.

The Catholic Foresters of Canton and Massillon will erect a granite mausoleum costing \$20,000 in Calvary Cemetery between Canton and Massillon.

The mill of the Vermont Marble Company, at Beldon, Vt., about two miles north of Middlebury, was destroyed by fire the past month with a loss estimated at \$75,000. The mill employed forty men and had large orders to fill.

Plans for the marble work on the new Interurban Station at Dallas, Tex., provide for one entrance in Tennessee marble and for another in Verde Antique and American Pavanazzo.

A new marble quarry has been opened up near Clinton, Utah.

While the granite manufacturers of Quincy, Mass., report a fair amount of business this Spring, they also declare that a large part of the Decoration Day trade was diverted to other cities, because of the recent strike in that centre.

It is expected that the new post office at Danbury, Conn., will be completed by the first of September. The interior is finished in marble and the entire structure is one of the latest

for the base courses while the limestone is used for the decorative features of the exterior.

A limestone crushing plant is to be established in Coeyman's Hollow, Albany county, N. Y. There are millions of tons of good limestone cropping out along the Helderburg Mountains in Albany county, but at present the lime used for fertilizing purposes is shipped in from other states.

Bishop David H. Greer during the past month blessed the out-door pulpit on the Cathedral of the St. John the Divine, New York. The pulpit was built in memory of Caroline Phelps Stokes by one of her relatives. It is a Gothic structure of light brownstone, 42 feet high and cost about \$20,000.

The Bedford Ground Limestone Company is erecting a new plant just outside of Bedford, Ind., to the southwest. A switch is being run to the new plant and the company expects to begin operations about the first of July. The product will be used mainly for fertilizing purposes. Felix Miller, of Oolitic, is the principal stockholder.

### Government Work

Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., for the construction of postoffices in the following cities: Until June 15th, at South Boston, Va.; until June 16th, at Neenah, Wis., and Middletown, Conn.; until June 20th, at Waterloo, N. Y., and Putnam, Conn.; until June 22d, at Minden, La., and Rumford, Me.; until June 23d, at Alliance, Neb., Alliance, Ohio, and Washington, Ind.; until June 26th, at Grinnell, Iowa, Redfield, S. D., and Pottstown, Pa.; until June 21st, for the postoffice and custom house at Douglas, Ariz.

The Lighthouse Department at Tompkinsville, N. Y., will purchase about one thousand tons of riprap stone for Little Gull Island Light Station, Long Island Sound, N. Y.

Sealed proposals will be received at the United States Engineer's Office, Custom House, New Orleans, until June 20th for furnishing and delivering stone at South and Southwest passes, Mississippi River.

The contract for the construction of the United States postoffice at Newport, R. I., has been awarded to M. Yeager & Sons, Minerva, Ohio, at \$244,966; for the postoffice at Evansville, Indiana, to C. Kanzler & Son, of that city, at \$134,000, and for the postoffice at Little Falls, Minn., to A. W. Lane, 19 South La Salle Street, Chicago, at \$53,375.

### Construction Notes

Gronenberg & Leuchtag, architects, have completed plans for two five-story houses for the Academy Construction Company on 150th Street, near Broadway, New York. The buildings will be of brick, limestone and terra cotta.

A 21-story commercial building, to cost about \$1,500,000 will be erected on the old Marshall Estate property at the northeast corner of Thirty-seventh Street and Seventh Avenue, New York, owned by Francis Bannerman. The facade of the building for the first story will be of limestone and marble. The main building will be ten stories, with a tower rising to the height of twenty-one stories. The architects are H. Craig Severance and William Van Alen.

Emory Roth is preparing plans for a thirteen-story brick, limestone and terra cotta apartment building to be erected at Park Avenue and Fifty-fifth Street, by Bing & Bing.

Bids will be received until June 20th for a masonry and concrete bridge at Napa, Cal.

Herman Barth, 12 Geary Street, San Francisco, has drawn plans for the southeast wing of the San Francisco Hospital. The building will be four stories high and will cost \$186,428.

Plans are being prepared for a factory for the New London Sand & Stone Company, near Uncasville, Conn.

Edgar A. Levy Leasing Company is erecting a thirteen-

story apartment house of brick, limestone and terra cotta at 157 West Fifty-seventh Street, New York. The architect is Robert T. Lyons.

The Chicago, Milwaukee & St. Paul Railroad will build a \$250,000 terminal warehouse in Tacoma, Wash.

Woodman & Carey, of Winnipeg, are preparing plans for a \$225,000 plant for the Stovel Printing Company, in that city.

The contract for a new plant for the General Leather Company on Frelinghuysen Avenue, Newark, N. J., has been awarded to Edward M. Waldron, Inc., of that city.

The contract for the masonry for the new packing plant for the Union Meat Company, North Portland, Ore., has been awarded to Bingham & Shelby, of Portland, Ore., at an estimated cost of \$150,000.

Henry Bacon, 101 Park Avenue, New York, is preparing plans for a \$35,000 monument at the Ninth Street entrance of Prospect Park, Brooklyn, N. Y.

The Baltimore & Ohio Railroad Company have awarded the contract for pier construction at Baltimore to H. S. Kerbaugh, Inc., of New York.

The Albany Law School contemplates the erection of a new \$75,000 building.

### WEST DOOR, CHURCH AT EAST MEON, ENGLAND

A striking example of the characteristic Norman herringbone ornamentation. Note also the Norman capitals.

Wells & Dana, of Boston, are preparing plans for an addition to the hospital at Brockton, Mass.

The Reformed Theological Seminary will erect dormitories costing \$100,000 at Lancaster, Pa., after plans by Dillon, McLellan & Beadle, 2 West 29th Street, New York.

The People's Savings Bank of Urbana, Iowa, will erect a two-story bank and lodge building.

The Home National Bank of Arkansas City, Kan., will erect a \$100,000 banking building after plans by Stevens & Viehe-Naess, 64 East Van Buren Street, Chicago, Ill.

Green Bay, Wis., is considering plans for a new high school to cost \$290,000.

Miller, Fullenwider & Dowling, 6 North Michigan Avenue, Chicago, Ill., are preparing plans for a \$100,000 school building for Vinton, Iowa.

The Illinois Valley General Hospital will erect an \$80,000 building at Princeton, Ill.

The Odd Fellows of Ft. Wayne, Ind., will erect a \$100,000

lodge building after plans by Charles R. Weatherhogg, of that city.

The University of Illinois will erect a building for the agricultural department at an estimated cost of \$2,000,000 at Urbana, Ill.

The city of Holyoke, Mass., is contemplating the erection of a Municipal Auditorium to cost about \$250,000.

Gloversville, N. Y., will erect an \$80,000 grade school building.

Circleville, O., will erect a high school building costing about \$130,000, after plans by Frank L. Packard, of Columbus, Ohio.

Bridgeton, N. J., will erect a high school costing about \$125,000.

T. I. Lacey & Sons, of Binghamton, N. Y., are preparing plans for a new building for St. Mary's Orphan Home.

William Chapman, 15 Ashburton Place, Boston, Mass., has prepared plans for a three-story building for the Norfolk County Agricultural School, at Walpole, Mass.

T. H. Hamilton of Harrisburg, Pa., has prepared plans for a church and Sunday School for St. John's Methodist Episcopal congregation at Sunbury, Pa.

A new high school, costing about \$100,000, will be erected at Lake Charles, La., after plans by Nolan & Torre, New Orleans, La.

Bids will be received until July 20th for a two-story memorial hall and armory at Chillicothe, Ohio. The plans are by Karl I. Best, of Columbus, Ohio.

The County Savings Bank, of Scranton, Pa., will erect a one-story bank building costing about \$75,000. The plans are by Robert W. Snyder, of that city.

W. C. Eckles, of New Castle, Pa., is preparing plans for a high school at Connellsville, Pa., to cost about \$190,000.

Ludlow & Peabody, of 101 Park Avenue, New York, are preparing plans for an auditorium to cost about \$130,000 for the Normal and Agricultural Institute, Hampton, Va.

The Y. M. C. A. of Anderson, Ind., will erect a new building costing about \$175,000, after plans by Cyrus D. McLane, Rock Island, Ill.

The contract for the construction of the new court house at Boone, Iowa, has been awarded to the Boyd Construction Company, of St. Paul, Minn., at \$155,948.

Day & Klauder, of Philadelphia, are preparing plans for three new buildings for Wellesley College at Wellesley, Mass., to cost about \$150,000.

The contract for the erection of the new seven-story banking building for the American Bank of Suffolk, Va., has been awarded to Harwood & Moss, of Norfolk, Va. The estimated cost is \$100,000.

The Masons of Osborne, Kan., will erect a temple after plans by F. C. Squires, of Topeka, Kan.

The contract for a woman's dormitory at the State Normal School, Kent, Ohio, has been awarded to Robert H. Evans & Company, of Columbus, at \$113,246.

The First National Bank of Visalia, Cal., is planning the erection of a five-story bank and office building, to cost about \$100,000.

The Security Trust Company of Lynn, Mass., will erect a three-story bank and office building after plans by Mowbray & Uffinger, of New York.

The First Presbyterian Congregation of Greensburg, Pa., has awarded the contract for a new church and parish house to Edward A. Wehr, Pittsburgh, Pa. The estimated cost of the buildings is \$155,000.

The Perth Amboy Savings Institution will erect a three-story bank and office building, costing about \$100,000. The plans are by Holmes & Winslow, 103 Park Avenue, New York.

Hensel & Weir, West Hoboken, N. J., are preparing plans for a school for St. Michael's Monastery, in that city, to cost about \$250,000.

## Business Embarrassments

Hampden D. Ewing has been appointed receiver for the John Liddle Cut Stone Company, of 402 East 107th Street, New York, on a petition in bankruptcy filed by three creditors. The liabilities are \$25,000, with nominal assets of \$12,000 and actual assets of \$10,000. The business was started many years ago and was incorporated on July 16, 1906, with capital of \$100,000. John Liddle, president, and John Liddle, Jr., treasurer.

Charles A. Lehrack has applied to the courts for the appointment of a receiver for the Lincoln Stone & Supply Company, of Lincoln, Neb. He also asks that Joseph L. Kennard be requested to pay a reasonable rental for the premises of the company named, which it is alleged he is using for other purposes, and that the action of the Board of Directors in allowing Kennard a salary for the past ten years be rescinded. The plaintiff alleges that prior to the beginning of this year he and Kennard were the sole owners of the property, but at that time Kennard pretended to transfer some of the stock for the purpose of controlling the board of directors and voting himself a salary and the use of the property.

Charles H. Barton, a granite manufacturer of Barre, Vt., has filed a petition in bankruptcy. He has liabilities of \$17,673.30, of which \$15,050 is unsecured claims. He has assets of \$13,776, of which \$350 is claimed exempt. Among the creditors are about twenty-five employees, who are owed from \$26 to \$60 in wages.

## Obituary Notes

Edward Russell, one of the best known granite men in New England, died in Gloucester, Mass., early in June aged 83 years. He quarried and transported on a specially constructed lighter the longest piece of granite on record as quarried in this country. It was used in the construction of the main arch of the Cathedral of St. John the Divine, New York.

George B. Milne, one of the most widely known granite quarrymen and manufacturers of Vermont, died in Denver the past month. Because of his health, he had been living for more than a year in Colorado. Mr. Milne was born in Scotland in 1857, but came to America in 1880. Three years later he settled in Barre and engaged in the quarrying and granite manufacturing business. Later he became one of the founders of the Boutwell, Milne & Varnum Company.

## Trade Notes

Ingersoll-Rand Company, 11 Broadway, New York, have recently issued three new bulletins as follows: Form 9023—on "Imperial" Tie Tamping Outfits. This apparatus had a gradual development under actual working conditions on some of the largest railroad systems in the country, extending over a period exceeding two years; it is comparatively new to the trade, but the railroads have been quick to appreciate the economy attendant upon the use of one or more of them. The Tamer is employed principally in the operations of laying new track, replacing old track and surfacing existing track, but is further effective in special applications. It will produce equally effective results in any kind of ballast—stone, gravel, earth, cinders, chat, slag, etc. Form 3026, catalogue on Ingersoll-Rogler Class "PRE" Duplex Direct connected Electrically Driven Air Compressors. Among the principal features of design may be mentioned the "Ingersoll-Rogler" Valve, the "Clearance Controller," Direct Connected Drive, Improved Intercooler, and Auxiliary Water Separator. Catalog is printed in two colors and profusely illustrated to show construction details. Four pages are devoted to pressure charts and tables showing sizes and capacities. Form 3312, catalog on Imperial "XB" Duplex Power Driven Air Compressors. Illustrated.

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The No. 14 CAVICCHI FLOOR-SURFACING MACHINE is equipped with a 2-H.P. electric motor (direct or alternating current).

One man can easily operate it, whereas other 2-H.P. floor surfacing machines require two men.

It is very compact, comparatively light, and easily carried from floor to floor. The width over all is 16 in. and the total weight of the machine, including extra saddle-weight of 90 lbs. is about 400 lbs.

This machine is covered by strong patents; infringements will be prosecuted.

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ONE MAN operating a Cavicchi Floor-Surfacing Machine can do the work of ten men rubbing by hand. It will rub from 500 to 900 square feet of ordinary terrazzo in a day. On granolithic floors, which is the severest test to which a machine can be put, it has performed an average daily service of about 200 square feet.

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One 90-lb. Iron Saddle-Weight  
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and will act as Sales Agent for HENRY R. WORTHINGTON, whose operation will be under the direction of the Worthington Pump and Machinery Corporation.

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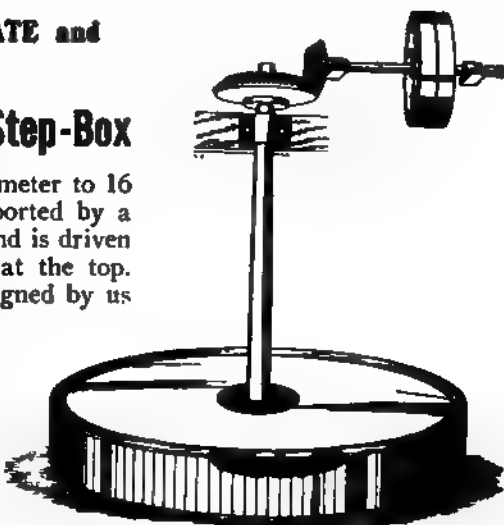
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**FRANK W. HOYT, Editor**

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## The Nature and Origin of Marble

**I**N 1914 an agreement was entered into, between the United States Geological Survey, the United States Bureau of Standards, and the Bureau of Mines, for a cooperative study of the building-stone industry of the country. In general, this agreement provided that the Geological Survey should study the data, compare the classification, extent, and geology of undeveloped and quarried deposits of stone and collect statistical information on production and value of output; that the Bureau of Standards should undertake all the physical and chemical tests required for determining the value of stone for structural purposes, or as aggregate for concrete, and that the Bureau of Mines should investigate all mining and technologic data, with special reference to safety, efficiency of operation, and prevention of waste. The general object of the cooperative agreement was to obtain comprehensive data on the occurrence, quality, and methods of preparation for the market of the various building stones of the United States. By agreement the work was begun with an investigation of the marble-quarrying industry.

The Bureau of Mines was fortunate in procuring for its share of the work the services of Mr. Oliver Bowles who had had experience in examining and describing quarries in Minnesota. During 1914 Mr. Bowles personally visited 64 active marble quarries. Through the cooperation of quarry owners numerous representative samples of the marbles of the United States were obtained and shipped to the Bureau of Standards for testing.

The result of the investigation of Mr. Bowles has just been published by the Bureau of Mines in the form of a bulletin bearing the title, "The Technology of Marble Quarrying." This is full of practical hints and discussions that will prove of the greatest value, not only to those engaged in the extraction of marble, but also to those who work and finish the quarried blocks. As to the nature and origin of marble, Mr. Bowles says:

In its geologic sense the term marble is applied to rocks consisting of crystallized grains of calcite or dolomite or a mixture of the two. Although limestone

has the same chemical composition as marble it differs in that the component particles of calcium or magnesium carbonates are granular and noncrystalline. In marble the crystals may be intimately intergrown, whereas limestone is an aggregation of unrelated particles cemented together into a solid mass.

In its commercial sense the term marble has a much wider application. As susceptibility to polish is one of its chief commercial assets, all calcareous rocks capable of polish are classed as marbles. Limestones that show little crystalline structure may, if they take a good polish, be classed as marbles. Furthermore, serpentine rocks, even if they contain little calcium or magnesium carbonate, are classed as marbles, as they are commercial substitutes of true marbles.

Aside from serpentine and other extraordinary varieties, marble is made up almost entirely of calcium or magnesium carbonates. A calcite marble may consist of 96 to 99 per cent. calcium carbonate. A dolomite marble, if impurities are disregarded, contains approximately 54 per cent. calcium carbonate and 46 per cent. magnesium carbonate. Marbles consisting of mixtures of calcite and dolomite may have compositions anywhere between these two extremes. The extremes may be illustrated by examples mentioned by Dale. Marble quarried near Proctor, Vt., contained 98.37 per cent. calcium carbonate, and a dolomite marble from Lee, Mass, contained 54.05 per cent. calcium carbonate and 46.93 per cent. magnesium carbonate. An intermediate type is represented by the crystalline magnesium limestone of Tuckahoe, N. Y., which contained 70.1 per cent. calcium carbonate and 25.40 per cent. magnesium carbonate.

A varying percentage of chemical impurities is present in practically all marbles. The more common of these are silica ( $\text{SiO}_2$ ), iron oxides ( $\text{FeO}$  and  $\text{Fe}_2\text{O}_3$ ), manganese oxide ( $\text{MnO}$ ), alumina ( $\text{Al}_2\text{O}_3$ ), and sulphur; less common are minute quantities of the oxides of titanium, potash, sodium, lithium, and phosphorous. Organic matter is commonly present.

The impurities of marble are present in the form of grains of definite minerals. In some specimens the individual grains may be too minute to be recogniza-



ble with the naked eye, and in others they may attain considerable size. The more common mineral impurities are quartz (or some other form of silica, such as chert or flint), hematite, limonite, graphite, mica, chlorite, tremolite, wollastonite, diopside, hornblende, tourmaline, pyrite, or marcasite. In the marbles of southern Ontario, Parks notes the occurrence of 37 minerals that have been formed by metamorphic processes acting on the impurities of the original limestone. The more common are quartz or some other form of silicon dioxide, pyrite, marcasite, mica, or chlorite. Most marbles of commercial value contain small percentages of impurities.

Marble is derived from beds of limestone. The latter are formed in the sea, mainly as accumulations of calcareous remains of marine organisms, such as corals, rhizopods, and algæ. Water containing carbon dioxide is capable of dissolving calcium carbonate from the rocks through or over which it flows, and in consequence the water of rivers is charged with lime carbonate as it enters the ocean. Thus a supply of dissolved calcium carbonate is always at hand from which the organisms may manufacture their shells. Countless generations live and die and as a consequence the calcareous accumulation may be of vast extent. In places, the chemical precipitation of calcium carbonate may add to this accumulation.

There is abundant evidence that many limestones are of organic origin, as some of them are merely aggregates of fairly well preserved shells. In most specimens, however, a few fragmentary shells only remain in recognizable form, all others, through the beating of the waves or other activities, having been broken into minute fragments.

By pressure of superincumbent material and by deposition of some form of cement in the intergranular spaces the mass is later consolidated as a firm and coherent rock which is termed "limestone." Beds hundreds and even thousands of feet in thickness have been formed by such processes.

Marble is regarded as being the product of the metamorphism of limestone beds. That granular noncrystalline limestone can be changed into crystalline limestone or marble has been proven in the laboratory, as shown by Clarke. From the results of various experiments he concludes that pressure alone, heat alone, or both together may result in the recrystallization. It is probable that the presence of water assists the process. Marble may therefore result from great pressure exerted on the strata by folding, or by heat produced from an igneous intrusion, or both agencies may work in conjunction. Recrystallization as a result of igneous intrusion has been observed by several authors.

Onyx marbles have a history rather distinct from that of the true marbles. Although consisting essentially of calcium carbonate, they are purely chemical deposits and have not resulted from the metamorphism of preexisting limestone beds. As pointed out by


Merrill, who gives a lengthy discussion of their origin and occurrence, they are of two types. One is a product of precipitation from hot springs, a travertine; the other is a deposit from cold water solutions in limestone caves. Most deposits of onyx are formed in successive layers. Impurities such as iron and manganese oxides may be present in varying amounts in successive layers, and thus a beautiful banding may result. From the nature of their formation onyx deposits are necessarily limited in extent as compared with deposits of true marbles.

Verd antique or serpentine marble is in no respect comparable with true marble either in composition or in origin. Serpentine is in general derived from the alteration of basic igneous rocks such as the peridotites, which are rich in olivine and pyroxenes, or from magnesium silicate rocks formed by the metamorphism of limestone. The process is accompanied by hydration, and an addition of 13 to 14 per cent. of water. The movement occasioned by the swelling that results probably accounts for most of the unsoundness common to verd antique.

### A Pen Picture of the Work Done in a Slate Mill

In a recently published English novel there is a vivid description of the interior of a slate mill:—"The dressing-shed and saw-house was a long, lofty building, full of light and air. Tramways ran into it from every side, and conveyed the great blocks of raw slate from the quarries to the hillmen. Aloft the beams of this workshop were whitewashed, and a revolving rod from the giant steam-engine of the works ran the length of the shed. Wheels spun from this rod at regular intervals, and from them fell a system of endless bands to the machines beneath. Some dropped to the saw-tables, some to the dressers sitting behind their guillotines. The main tramway separated these operations, and from time to time little tumbrils entered, dragged by a horse. They brought fresh slate, and removed the masses of splinters and debris. The air was misty with slate-dust, and through the haze whirled the endless straps, flashed the steel wheels from which they came, and moved the drab figures of a hundred men and boys. The prevalent color of the shed and all therein was grey-blue, dim on dull days, brightened from the glass roof on sunny ones. Then golden light winnowed down through the dusty air, flashed on the faces of the saw-tables, and struck brightly along the surfaces of the polished metal, and the wet planes of the slate. Besides each sawtable stood the great masses of native rock, and men prepared them for the saw. First a steel gouge made room for the cutter, then followed the picker, and as it divided the main masses into thinner layers one might mark the consummate skill and accuracy that accompanied the labor of the splitters."

## Architectural Use of Big Stones

OME years ago a party of English quarrymen came to this country and paid a visit of friendly inspection to the Indiana limestone district and other quarrying centers. They were quoted as greatly impressed by the elaborateness and perfection of our quarry and mill equipment and the ease and celerity with which enormous blocks of stone were extracted, worked and handled. There was nothing approaching this, they declared in all England. It must be known that they spoke with authority. Among the members of the party were leading quarrymen of the island of Portland. In Great Britain Portland stone occupies much the position of Indiana limestone with us. It is widely used in all parts of the British Isles. The quarries have been operated extensively for more than one hundred years, and one would think that nowhere else could a more perfect equipment be found.

This frank comment by our visitors is recalled by a recent article in one of our English technical exchanges. It is a description of one of the most striking structures erected in Liverpool during the past few years. This is the six-story Cunard building, nearly 200 by 170 feet, and embodying in its architectural style that best features of the Italian Renaissance as represented by the Farnese Palace at Rome. The exterior is entirely of Portland stone, there having been used no less than 150,000 cubic feet, weighing about 11,000 tons. The special comment to which we wish to call attention is this: "The largest blocks are at the angles of the battered and rusticated ground floor wall. They weigh 14 tons, and as they were too

heavy for the electric cranes to lift, special methods had to be improvised for raising and fixing them." The handling of 14-ton blocks in building work in this country is such a commonplace as to call for not even passing mention.

Before commenting further upon this particular subject, attention should first be called to some other features of this really notable building. It stands on a strong sloping rusticated base built of rough big stones. Large plain wall surfaces are broken only by the rusticated angles and the windows of the first floor. The fifth-floor windows are absolutely devoid of decoration to emphasise the greater elaboration of the parts above and below them. The building is capped by a highly decorated frieze and heavy projecting cornice with a plain coping wall. Every appropriate design has been adopted to increase the interest of the building. Projecting doorways rough in general outline, but with great refinement in the porticos, and heavy arched windows to the ground floor, all tend to enhance the greater detail of the finished plainness of the other parts of the building.

The carving is itself not only decorative but of great interest in the choice of subjects. The shields in the frieze on the Pier Head elevation call attention to the period of disturbance during which the building has been completed by bearing upon them the arms of the Allies. Great Britain and Ireland, France, Russia, Italy, Japan, Belgium, Serbia, and Montenegro are there conspicuous, and at the four angles of the building is the shield of the Cunard Company, supported on a great eagle. On the heads of the fourth-floor

ENTABLATURE AND PEDIMENT, NEW YORK PUBLIC LIBRARY

Showing the six heroic statues carved by Paul Bartlett, sculptor, of Georgia white marble from the quarries of the Georgia Marble Company, of Tate, Ga.

windows, looking towards the river, are the arms of the principal ports of the United Kingdom and down the sides the ancient emblems of the signs of the Zodiac, while over the doorways and on the projecting base are to be found nautical emblems, Storm and Neptune, Peace and War, Britannia and typical faces from distant lands, such as the Negro,

This is largely responsible for what frank British critics themselves have graphically termed their "streaky bacon style." As they cannot give the idea of strength and massiveness by the free use of big stones, they made an effort to gain these qualities by boldly and strongly rustivating nearly all joints. No device in stonework grows more tiresome and depressing by constant repetition than rustication. Again, there is a very infrequent use of monolithic columns, or even of columns built up of a few large drums. Instead of these, their columns are usually in thin, alternating sections of circular and octagonal drums, such columns, for instance, as are an eyesore to all Americans on the ground floor of the New York postoffice in lower Broadway. Perhaps some such device as this is necessary if drums can be had only a foot or sixteen inches in thickness, but think how it compares with a fluted, or even a plain shaft!

In every leading city of the United States are public and private buildings containing masonry blocks of immense size and huge monolithic columns. Architects are never restrained in their designs by fear that the quarrymen and stone setters cannot meet their requirements. And this is no modern condition. As far back as 1859-61 there were furnished from a Maryland quarry for the National Capitol in Washington no fewer than 108 fluted monolithic columns, each twenty-six feet long. It would be impossible in this connection to enumerate all the great stones that have been supplied from American quarries for building work, but a few may be mentioned, just to show that they are not confined to any one locality. An illustration is given in this number of the setting of the marble columns in the Cleveland Art Museum. To cut these, rough blocks were required measuring 4 x 4 x 25 feet, and weighing about forty tons each.

The columns in the Tiffany building, New York, are twenty-eight feet eight inches by three feet six inches, and were cut from rough blocks weighing forty tons each. In the New Orleans postoffice are sixteen monolithic columns each twenty-six feet by three feet and weighing approximately twenty-five tons. In the Penn Mutual Life Insurance building, Philadelphia, are columns thirty-five feet by five feet two inches, weighing about forty-six tons. In the People's Trust Company building, Brooklyn, are four monolithic columns weighing about twenty-four tons each. The Pennsylvania State Capitol at Harrisburg has forty columns, twenty-nine feet by three feet nine inches, and there are thirty-nine monolithic columns in the Scottish Rite Temple at Washington that are thirty feet, two and five-eighths inches by four feet two and five-eighths inches, weighing about twenty-three tons each. For the court house at Lebanon, Ind., certainly not one of our leading cities, there were shipped blocks of stone thirty-seven feet by four feet four inches, weighing fifty tons each, to be cut into columns. The

STATUE OF PHILOSOPHY, NEW YORK PUBLIC LIBRARY  
An heroic figure in Georgia white marble from the quarries  
of the Georgia Marble Company, Tate, Ga., designed,  
modeled and carved by Paul Bartlett, sculptor

the American Indian, the Australian Aborigine, and others.

It is a commonplace of criticism that the architecture of any country is very largely affected by the materials of construction most frequently used. It is an unquestioned fact that British architecture has been very largely modified by the inability or unwillingness to quarry and handle large blocks of stone.

lower sections of the eight columns in the sanctuary of St. John the Divine in New York weigh approximately ninety tons each. In the Baltimore courthouse are eight monolithic columns, each thirty-one feet two and seven-sixteenths inches by four feet two inches, and weighing, in the rough, 93,000 pounds each.

In monumental and decorative work we have accomplished even greater things. The West Point battle monument is of polished granite and measures forty-one feet six inches by six feet. The shaft of the Sault Ste. Marie monument weighed when shipped nearly 100 tons. For the bowl of a foundation in a suburban residence near New York, a block of granite was quarried twenty-two feet by twenty-two feet by five feet three inches, weighing fully 225 tons. When this was finally cut to shape it weighed about sixty tons.

The above facts are given because they are easily ascertainable. It would be difficult to get particulars of specially large blocks for masonry work, but it is apparent that our quarries can readily furnish anything that may be required in reason. This gives the architects a free hand in their designing, and is one of the reasons why our recent architecture has attracted world-wide attention for its fitness, dignity, strength and consequent beauty.

#### Freight Rates on Stone to Newark

The New Jersey State Board of Commerce and Navigation is making a fight before the Interstate Commerce Commission for a point freight rate for Newark and neighboring Jersey cities outside the lighterage district of New York. The special commission of the board is obtaining from merchants and manufacturers of the cities in the district specific instances to illustrate how the present lack of differential rates affects them. One of the letters received was from the Monahan Stone Company of Newark, of which former Sheriff John F. Monahan is president, and which contracts for all kinds of cut stone work, with offices and yard on Plum Point lane. It sets forth in detail the handicap which a freight rate equal to New York's, which includes free lighterage, works upon one Newark plant. The material portion of the letter follows:

"The complaint we wish to submit in this connection is: Most of our business is New York work, and our New York competitors, whom we have to figure against, have the advantage over us in freight rates. We are located on the Central Railroad of New Jersey tracks in Newark, N. J., with a private siding running into our shop. Most of our shipments come from Bedford, Ind., the freight rate being 29.3 per hundred weight in carload lot shipments. Our competitors in New York pay the same rate of freight as we do, while it is necessary for the railroads in their case to haul the stone that much farther (from Newark to New York), and in addition to this, when it arrives

on the Jersey shore they have to load same on a lighter and make delivery free of charge to either New York or Brooklyn or to certain parts of Long Island, as this is taken care of in the freight rate of 29.3 cents. We cannot see the justice of our having to pay the same freight rate as our New York competitors, whereas it is not necessary for the railroads

STATUE OF THE DRAMA, NEW YORK PUBLIC LIBRARY  
One of six heroic figures in Georgia white marble from the  
quarries of the Georgia Marble Company, Tate, Ga.  
Designed and carved by Paul Bartlett, sculptor

to make this extra haul or do any lightering on stone coming into our shop.

"In addition to our paying the same freight rate as our New York competitors, after we manufacture this stone we have to haul it by truck to the New York market, wherever the job may be, which costs us on

an average about ten or twelve cents per hundred-weight, which is an added cost that the New York men do not have to figure. But still we have to compete on jobs with these same men, they having that much advantage over us. We might also state that we hire the same men and pay the same wages as do New York employers, our cost of manufacture being the same."

### A Street Railway Crushing Plant

The Rochester Street Railway Company crushes considerable stone for concrete work, paving between the tracks, etc. It has a specially designed plant containing some novel features that are of interest. Donald P. Falconer, engineer of maintenance of ways, gives the following description of the plant:

"About two years ago a stone crusher was rented

for the screenings, one for 1/2-inch to 3/4-inch stone, one for 3/4-inch to 2-inch stone, and one for the tailings. This bin has a side charge so that it can be placed next to the track and the crushed stone loaded directly into the work cars. It is also provided with the usual type of elevator and screen. The crusher, however, was designed especially for the work in question and was built by the Wheeling Mold & Foundry Company. It consists of a standard crusher mounted on wheels and connected by means of a belt drive to a motor mounted on the same truck with the crusher. The truck is designed with a gooseneck and provided with broad-tired wheels so that the crusher may be hauled over pavement and transported to various points. The gooseneck is provided with a locking device, and a duplicate set of wheels with standard car wheel flange has been designed so that they can be substituted for the road wheels and the crusher hauled directly to the track.

"The method of mounting the motor on the same truck with the crusher makes a very compact machine which can be transported from place to place, the idea being that concrete excavated from the streets need not be hauled to the yards for crushing, but can be piled alongside the trench.

"The motor on this crusher is of 35 horse-power operating at 550 volts, so that the power can be taken directly from the trolley wire at all times. The crusher is provided with 9-inch x 16-inch opening and manganese steel jaws. This equipment has been in operation for only a few months but even in this short period it is evident that it will much more than pay for itself in a very short time. It will be noted, too, that this complete outfit has the flexibility of the average contractors' plant and in addition provides for the special requirements of electric railway work."

### Michigan Verde Antique

A local newspaper says that Mr. C. H. Carter, manager of the Michigan Verde Antique Marble Company, will instal another channelling machine in the quarries near Ishpeming, Mich. The paper says: The upper portion of the marble exposure at the point where operations have been in progress since last fall has been cleaned away, leaving a fine showing of solid marble for the channellers to cut up. There is a good demand for the marble and it is disposed of as fast as the manufacturers can get it ready. It will be understood that this is a "trial run" of the stone, and the future depends upon the success met with in the quarrying, sawing and polishing. Thus far everything has been most favorable and each succeeding cut taken horizontally from the deposit is going to find marble of still better quality. The work has now reached a point where there has been a big improvement in the quarry sap, as the stone men term it, and very beautiful blocks are being cut. The managers are very optimistic over the future of the enterprise.

### SETTING COLUMNS, CLEVELAND MUSEUM OF ART

There are four fluted Ionic columns, more than 24 feet high, cut from rough blocks 25x4x4 feet, weighing 40 tons each Of Kennesaw marble from the Georgia Marble Company, Tate, Ga.; cut and set by the Blue Ridge Marble Company, Nelson, Ga.

and installed for a few months and the pile of stone which had accumulated at that time was crushed and used as ballast and for the making of concrete. This experiment proved so successful that it was found advisable to design some special equipment to meet the requirements. This equipment consists of a 30-ton bin, with screen and elevator and a stone crusher.

"The bin is divided into four compartments: One

## Granite Block Paving



FOR many years the cities of this country have been experimenting with different forms of street paving. Brick, wooden blocks, asphalt and various patented processes have all been tried, and have each been hailed by their advocates as the final word in paving. But one by one they have been found not to stand up well under the tremendously heavy traffic in the modern city and to need frequent and costly repairs and replacements. The general tendency everywhere now is to give the preference to granite block paving. It has always been recognized that this was the cheapest pavement in the end, because it is by far the most durable, and it commends itself from the fact that it does not become slippery but gives the surest footing for horses. The main objection formerly urged against granite was that it was noisy. It is found that this complaint is obviated by the use of better made blocks and by greater care in laying. An exchange describes in detail the most approved modern practice in the laying of granite blocks, and if the method is generally followed it will do much to solve the vexed question of street paving.

There is such a variety of methods used in the handling of the quarried granite blocks that what one citizen or engineer may term a good or successful granite-block pavement might be termed a failure by his neighbor or fellow-engineer, says the writer. In order to make these statements clear, therefore, they will be largely confined to what is known as the "Improved Granite Block"; especially as it is a fact that no citizen should permit the laying and no engineer should specify or accept a pavement of granite block which

fails to result in an even surface in every way acceptable for both horse and automobile traffic.

To secure a smooth, even surface—so perfect, in fact, that no crosswalks or bridgestones are used or needed—it is necessary that the engineer specifies a carefully made granite block having no projections on the surface exceeding  $\frac{3}{8}$  inch from an even plane, and that the blocks be laid in the street on a properly drained sub-foundation, a substantial concrete foundation, and with close, even joints, and that these joints be filled with a bituminous filler of asphalt or pitch, or grouted with a cement grout consisting of one part cement and one part sand.

The use of the two different types of fillers is largely a question of the likelihood of future openings being made in the pavement. If frequent openings are apt to be necessary, the bituminous filler is more convenient, and where traffic conditions demand quick repair it is preferable.

Where openings are not apt to be frequent or where traffic conditions would allow blocking off for a reasonable period for the cement grout to set properly, the cement grout filler should be used and will give better results usually than the bituminous filler. To secure the best results with the bituminous filler, it is essential that specifications distinctly demand, and that inspection be so rigid, that a city will secure a block of reasonable hardness, toughness, and one that shows a proper resistance to abrasion.

At the present time, there are so many methods being used and such a varied lot of tests being made that the selection of granite from some quarry which

MUSEUM OF ART, WADE PARK, CLEVELAND, OHIO

Architects, Hubbell & Benes, Cleveland. Built of Kennesaw marble from the quarries of the Georgia Marble Company, Tate, Ga. Cut and set by the Blue Ridge Marble Company, Nelson, Ga.

already has made a record for quality through service given in specific streets in different cities and under different traffic conditions is undoubtedly the safest course for the engineer, unless he has satisfactory facilities for making suitable tests that he knows will provide the proper granite to meet his requirements.

When the blocks are delivered, care should be used in the inspection to see that blocks meet the specifications as to size. Blocks with uneven heads, having depressions of more than  $\frac{3}{8}$  inch depth as a maximum, should be rejected. The average citizen to-day demands, and is entitled to, an even-surface pavement. Large bunches or undue depressions in the blocks make an uneven-surface pavement which gives just cause for complaint regarding noise from traffic.

Granite paving blocks should never be thrown from a wagon one by one. Always use some form of dump wagon. Thousands of good blocks are spoiled for good paving every year through careless handling.

The next feature of importance is to specify and secure blocks which permit laying with even, close joints; joints for bituminous filler pavements not to exceed  $\frac{3}{8}$  inch and for cement grout filler pavements not to exceed  $\frac{1}{2}$  inch. When blocks are laid with wider joints than  $\frac{3}{8}$  inch for bituminous filler work, the blocks will begin to "turtle" or round on all the edges within a few years, on account of the steel shoes of horses tending to chip and break off small pieces every time the calk slips into the joint. With the close, even joint, properly filled, the horses can secure good footholds when handling heavy loads, and the edges are so close together that both blocks on the sides of the joint are forced to take the strain and blow, and neither block is broken or chipped. A slightly wider joint may be used for cement grout filler work, as the filler must penetrate well down to the bottom of the block and thoroughly bond the blocks into a monolith form.

Granite blocks vary in size in different locations, and no specific size can be given preference; but it is important to see that all blocks in any single course across the street or area being paved are of the same width; as the use of a  $4\frac{1}{2}$ -inch block in the course with a  $3\frac{3}{4}$ -inch block will leave a chance for the narrow block to become loosened, and this gives a chance for the next and next blocks to move. As a result, an opening in the joint develops and water seeps through to the concrete and shifts the cushion below or upheaves the blocks in the area through freezing in the winter. Of course, with the grout filler the danger is not so great, but it exists.

Granite blocks should not vary more than  $\frac{1}{2}$  inch in depth in any case. Much of the old-time unevenness of surface came about through carelessness on this point. Variations in length are not important, with the exception that blocks over twelve inches in length should not be used, and the variation in lengths

should be sufficient to always allow for breaking the joints at least three inches so that ruts cannot develop from two end joints being continuous.

When laying blocks, great care must be used to see that the sand cushion or mortar cushion over the bed of the concrete is not deeper than necessary. A cushion of  $\frac{3}{4}$  inch to one inch is ample, and the frequent practice of using a cushion of  $1\frac{1}{2}$  inches to two inches should be abandoned. Before the specifications for improved granite blocks developed there was some excuse for this practice, as the blocks frequently varied one inch or more in depth; but engineers now know that this extra depth of block and sand cushion were the cause of much unevenness of surface.

Inspectors having charge of granite block paving work need also to insist that pavers refrain from the common practice of padding out the joints to secure yardage, especially with bituminous filler work. The contractor or city engineer, if the job be city work, should remember that although filler is less expensive than granite blocks, granite blocks are sold by the square yard laid. It is thus cheaper to lay close joints and save in the quantity of filler; the price for granite being the same whether large or small joints are used.

After the blocks are laid in proper course, they must be thoroughly rammed. All low blocks should be lifted and re-bedded and re-tamped until the entire surface of the pavement is both even and firm. It is best to specify one rammerman to two pavers to ensure that every block is rammed to a firm bed.

The main trouble from poor ramming is that the poorly bedded blocks will go down under traffic and the surface of the pavement will soon be very uneven; while, on the other hand, properly laid granite block pavements have given service for periods of twenty years and more without a single block showing appreciable wear, or any unevenness of surface developing.

In laying granite block pavements it is never necessary to use expansion joints, although an expansion joint has been laid next to the curb in a few instances to break the monolith bond between the pavement and sidewalk and buildings on the street.

Unlike the old style rough granite block pavement, the improved block properly laid makes an even surface pavement which eliminates most of the noise of vehicles and provides an excellent surface for horse-drawn traffic under all weather conditions, while at the same time meeting the demands of fastidious motorists. To secure such results, the extra care in laying as suggested in this article and the slight extra cost for granite are amply repaid.

### Priceless Statuary for Philadelphia

Two art treasures which for more than four centuries have been owned by the Martelli family of Florence, Italy, and which were recently bought by Joseph E. Widener of Philadelphia, were removed the past

month from the steamship *Re d'Italia* to the Appraiser's Stores in New York, where they were passed upon and admitted without duty.

They are marble sculptured by Donatello. One is a life size bust of the boy St. John. It is valued at \$300,000. The David, a life size figure, is regarded as worth \$200,000. Both have been sought by American collectors for many years. To obtain the consent of the Italian Government for the exportation of these treasures the former owners were obliged to donate a third Donatello to a museum.

The acquisition for an American collection of two authentic pieces of sculpture by Donatello is a piece of good fortune liberally to be applauded, says a leading critic. Of all Italian masters, this Florentine, worshipper of the past and prophet of the future, has for us the most valuable lesson. He represents a spirit in art with which Americans are especially sympathetic, but which in their own country they have seen revealed chiefly by secondary works. It was his especial genius to turn back toward antiquity without becoming an imitator, to find in classicism an impulse toward progress, to mingle vigor of individuality with self-subordination, and in his work to unite reality with idealism.

A number of works attributed to him were in this country before the "David, Conqueror of Goliath," and the "Bust of St. John" came from the Casa Martelli. The most notable is the laughing bronze "Amor" in the Widener collection, formerly in the collection of the Duke of Westminster. This bust has aroused much discussion, and a number of differences of opinion have been expressed concerning its subject and origin, many of them amusingly wideflung from what to a plain mind seems the obvious Donatello mark.

Another interesting work is the relief belonging to the Quincy A. Shaw collection in Boston, representing the "Madonna and Child Surrounded by Angels." Upon the authorship of Donatello so far as the beautiful composition is concerned most critics agree, Dr.

Bode finding the master's hand "in every line." There are other objects in the Morgan, Altman, Everit Macy, and Henry Walters collections all of which Professor Alan Marquand has discussed in "Art in America," opening his article with a paragraph calling attention to the difficulty of obtaining an important example by Donatello, whose works are "so well known, so highly

#### THE BROOKE MEMORIAL AT MEMPHIS, TENN.

Architect, James Gamble Rogers, New York. Built of Kennesaw marble from the quarries of the Georgia Marble Company, Tate, Ga. Carved by the Blue Ridge Marble Company, Nelson, Ga.

prized, and so securely housed" in the country of their origin. It is the general expectation that the European War, with its tremendous drain on national resources, will bring many more great art treasures to this country.



## Publicity for Stone Products

**C**E called attention recently to the fact that the Welsh slate producers, in connection with commercial and civic bodies interested, had called a conference to devise, if possible, some means to stimulate the slate industry. The meeting was held at the leading shipping port for Welsh slate, and resulted, as most such conferences do, in considerable talk and little definite action. A committee was instructed to consider the best methods of cultivating public opinion in favor of slate through the media of trade journals and newspapers. As far as we can learn from the information now at hand, the committee must still be considering the matter, for no publicity campaign has been undertaken as yet. In commenting upon the proposal, the official organ of the producers, the *Slate Trade Gazette*, says "There is no way of educating the public with regard to the advantages of any given material to be compared with that of discussion in the columns of trade journals or newspapers. In fact, it is the only practical way of getting in touch with the masses. The 'commercial' solicits his units, the public speaker on technical matters his tens, but the editor appeals to thousands. The films might be made useful instruments of education, but the taste of the class who patronize picture palaces is for love and thrills, and few proprietors would select manufacturing processes as subjects unless well subsidized." The writer finally suggests that "it would be profitable to engage a writer specially for the purpose of popularizing slate in the press, and give him a carte blanche. If the responsibility is placed on one salaried official the work is likely to be well done. If the business is left to everybody, nobody will do it, and we shall make no headway."

Because of the increasing use of artificial substitutes, fostered by unstinted advertising, various branches of the stone industry, in this country as well as abroad, have been awakened to the necessity of undertaking publicity campaigns. We have told in these columns of the plans of the producers of building granite in the United States to educate the public as to the unsurpassed merits of their material in constructional work. The idea is to establish a central headquarters, in charge of competent experts, who will not only try to interest the general public in granite, but will also work directly with the architects and builders. Their valuable and useful campaign is to be paid for by a small tax per ton on output as shown by shipping receipts, and levied upon all producing members of the association. That the scheme has awakened widespread interest is shown by the fact that granite producers among our Australian subscribers have written to us for full particulars. They declare that a similar campaign is sadly needed in that country, and hope that they may undertake it soon.

We have always welcomed every effort that has been made for publicity along such lines as these. The ordinary man who builds knows little or nothing about stone and frequently he cannot tell one variety of stone from another. Truth compels the admission that a surprisingly large proportion of architects is also woefully ignorant concerning one of the most important materials of construction. These people need to be told, not once nor spasmodically, but constantly and convincingly, of the nature and physical characteristics of stone, of its eventual cheapness because of its durability, and of its beauty, fitness and adaptability for every kind of building work. This is a task that does not belong to the individual quarry or stone mill, but to those associations that are formed to foster the interests of the entire trade. There is only one objection to a campaign of this kind. Sometimes the members of the association that undertakes an organized publicity work feel that this releases them from the need of individual effort. They become apathetic themselves, with the idea that as long as a general publicity campaign is on foot, they can sit back and wait for orders to pour in for their own particular product. As a matter of fact, the community effort should merely pave the way for their own individual zeal and activity. The makers of artificial substitutes subsidize costly periodicals, contribute thousands of dollars for a general propaganda, and then each one pushes his own product with liberality and tireless enterprise. The stone men cannot be content with the methods of the past if they expect to progress, or even to hold their own. It would be as reasonable to think that armored knights and crossbowmen of the Middle Ages could stand against a modern army, equipped with heavy artillery, machine guns and liquid fire.

In this connection it may be well to give another extract from the *Slate Trade Gazette*. Our English contemporary quotes from these columns the article printed a month or two ago, showing the decline in the production of slate in the United States. This we attributed very largely to a lack of enterprise, both in quarrying and merchandizing, on the part of the slate men. Commenting upon this, the writer says: "The position in America is vastly different from ours. There they have any amount of scope, practically there is a whole continent to slate as Mr. J. B. Johnson once tersely remarked. Slate ought to have made considerable headway, but so far from doing that, it has lost ground and this extract furnishes the reason. Though the situations in this country and America are hardly on all fours, we may learn a valuable lesson from their experience. A good thing will always outpace an inferior one given the same advantages and good quality slate would easily cut out composition roofings were it as well advertised. The reason that artificial

slates are catching up to the natural product is not by any means on account of their intrinsic merits, but simply through more efficacious advertisements."

### A Remedy for "Creeping" Marble

"The Technology of Marble Quarrying" is the title of a bulletin just issued by the Bureau of Mines of the Department of the Interior, Oliver Bowles, quarry technologist, being the author. The aim of this bulletin is to present to the marble workers of the United States a concise statement of the most efficient and economical methods now in use for producing and preparing marble. The bulletin refers chiefly to the methods employed in the quarrying of marble and the conditions that affect successful operation; the structure of marble and its relation to quarry processes; waste through rock imperfections and inefficient quarry methods; and means of eliminating such waste or utilizing it if elimination is impossible.

"Perhaps the most important feature of the bulletin," said Van H. Manning, Director of the Bureau of Mines today, "is the pointing out of a method for relieving earth pressure in certain quarries particularly subjected to natural strains. During the process of quarrying, this strain is relieved locally and the expanding rock breaks up into irregular masses, the fractures often being accompanied by loud reports. A method of avoiding excessive waste due to the production of these irregular fragments is described. It is advised that rows of deep, closely spaced, vertical drill holes be projected in a line across the quarry in such a manner that the rock may expand and partially close the drill holes, thus giving relief from strain without the destructive fracturing. One Tennessee marble company has already tried this method and has thereby greatly reduced the proportion of waste marble, and thus affected a saving of several thousand dollars. It is believed that several valuable quarries which have during recent years been abandoned on account of excessive strain breaks could be reopened and worked profitably if the methods proposed in this bulletin were adopted." Copies of this publication may be obtained free of

charge by addressing the Director of the Bureau of Mines, Washington, D. C.

### Tennessee Marbles

Although marble is the most important product of Knoxville, Tenn., there being thirty-five mills and quarries in the city district, producing values which have reached \$3,000,000 a year, the great variety and value of Tennessee's marble deposits were unknown until 1853, says an exchange. Between that year and 1857 the two large additions of the capitol at Washington, wherein the United States senate and the house of representatives sit, were built of this marble. The beautiful East Tennessee variegated marble is the material of which the desks of the president of the senate and the speaker of the house, as well as the railing of the stairway leading from the first floor of the capitol to the galleries of the house, were built.

### Asbestos in South Africa

A discovery of fibrous asbestos occurring in South African rock formations in which asbestos has not heretofore been found is reported by the American Consul stationed at Johannesburg. It is of a new and superior character, and one which, it is thought, may have an important bearing on the asbestos industry. It is said that the available quantity is considerable; it is of a new color, mostly golden brown.

FRIAR'S CLUB, WEST FORTY-EIGHTH STREET, NEW YORK

Built of Indiana limestone furnished by Shea-Donnelly-Giberson Company, Bedford, Ind.  
Architect, Harry A. Jacobs, New York. General contractors, John T. Brady & Co.,  
New York. Cut stone contractors, Monahan Stone Company, Newark. Modeling  
and carving, Dominic Walsh, Belleville, N. J.

## Hoisting Apparatus in Quarry Work



THE proper inspection and care of hoisting apparatus in quarries and stone sheds is of the utmost importance if accidents are to be avoided. Comparatively little has been written on the subject, which gives the greater value and timeliness to a memorandum just issued by G. S. Taylor, one of the English inspector of factories, and put out by the Home Office. Everything that is said about chains and other hoisting gear has direct application to the stone working industry. Mr. Taylor says:

The metal of which chains and similar appliances are constructed becomes hardened by overstrain, produced by stresses which exceed the elastic limit,

ing or hammering these metals at a "blue heat," i. e., between 450 and 600 degs. Fahr. In this hardened condition the metal is more liable to fracture by shock owing to absence of local ductile yielding. The hardening effect of overstrain is removed by the process of annealing, which consists in heating the metal to redness (about 1,400 degs. Fahr.) and cooling it slowly. After such treatment the metal reverts to its former state as regards ductility, but is generally reduced in ultimate strength.

In addition to the hardening, the metal of a chain undergoes deterioration due to repeated loading, an effect, known as "fatigue," which is common to most metals used in construction. Owing to "fatigue" a load considerably below the ultimate strength of a bar, if it is removed and applied a sufficient number of times, will eventually cause its fracture. As previously mentioned, recent research has shown that "fatigue" does not produce crystallization of the metal, nor can its effect be removed by annealing.

Cast-iron links of conveyor chains are converted into malleable cast-iron by a process, wrongly called "annealing," in which the castings are placed in boxes of powdered haematite (iron oxide) and maintained at a red heat for several days. This treatment decarbonises the skin of the casting and a portion of the interior, makes the metal malleable like wrought iron, and increases its tenacity.

Annealing has long been recognized as a useful precaution for lessening the risk of fracture in chains and similar lifting appliances, and is largely adopted by chain users. Methods of annealing vary, and some have certain disadvantages, but the best is that known as "close annealing," a process used by a few firms who have the necessary plant. The chain or article to be annealed is placed in a gas or oil-fired muffle furnace, heated to redness, while avoiding contact with the air, and then allowed to cool slowly either in the furnace or covered with dry sand or ashes after removal. "Close annealing" prevents oxidation and subsequent scaling of the surface of the metal, and the chain is heated more uniformly than in other types of furnaces. Coal or coke may also

be used for a "close annealing" furnace, and a fire-clay gas retort is said to make a good muffle for these furnaces.

In many works, however, annealing is done either in an ordinary reverberatory furnace used for heating plates, or in a small furnace of the same type specially built for the purpose. The chain or articles should not come into contact with the fuel, which should be as free as possible from sulphur or phos-

FIRST CONGREGATIONAL CHURCH, MONTCLAIR, N. J.  
Architect, Bertram G. Goodhue, New York. General contractors,  
Charles T. Wills Company, New York. Cut stone contractors,  
George Brown & Co., Newark. Trimmed with Indiana  
limestone from the Reed Stone Company, furnished  
by Arlando Marine, New York

either with an overload or when a load is suddenly applied or quickly arrested during its descent. Such overstrain alters the physical properties of the metal, and the alteration may continue for days or even months, with gradual development of greater hardness and a consequent decrease in the power of elongation, changes attributed by Unwin to the slow accumulation of permanent set. A similar effect is produced in wrought iron and mild steel by work-

phorus. Where an ordinary plate furnace is used, the chains are often placed in the hot furnace on Saturday and removed on the following Monday, when quite cold. In special annealing furnaces the chains are maintained at a uniform red heat for some time; after removal they are either allowed to cool in a mass on the shop floor, or cover with sand or ashes and cooled slowly. It is contended by some that cooling in sand or ashes is unnecessary for wrought-iron articles containing little if any carbon, whilst these precautions are considered essential by others. Possibly the cooling *en masse* is almost as effective for practical purposes, especially if the articles are covered with plates to prevent the chilling effect of cold air. Several chain users, however, have demonstrated by experiment the advantage of slow cooling, and the results of tests show that the ductility of iron, as indicated by the contraction of area and elongation of a fractured sample, is greater with slow cooling than with rapid cooling, though the ultimate strength is reduced by the former.

A rolled bar of iron is somewhat harder on the exterior than in the interior; this hardened skin is generally retained after the bar has been converted into a chain, and prevents, to some extent, wear of the links. Annealing tends to make the surface softer and more ductile; hence, an annealed chain is liable to wear more rapidly. In addition to the actual reduction in ultimate strength, there is always a slight loss of material due to oxidation, and the links of a chain, after repeated annealing, become appreciably reduced in diameter, and thus weakened. This loss may be obviated by "close annealing." Some consider that annealing tends to open the welds of the chain links at their edges, but this view is not generally accepted. Opening of the welds may possibly be due to subsequent testing of the chain, and not to annealing.

The period between consecutive annealing of chains and other appliances should depend on the time taken to harden the material by overstrain under ordinary working conditions. A chain may be more overstrained and become brittle sooner by a single severe shock than by weeks of steady use. If possible, any overstrained chain should be annealed at once, but this is seldom practicable. It is, therefore, the practice of railway companies and other large users to specify definite periods (roughly based on the nature and amount of work done by the chains) for annealing different classes of chains. Those in constant and severe use, such as crane chains for loading or unloading coal at docks, are often annealed once in every three months; for less frequent and severe use, once in every six months. All sling

chains and chains on power-driven lifting appliances should be annealed once a year, whilst for chains of hand cranes which are only used occasionally, the period for annealing may be two or three years.

The need for thorough examination of every link of a chain after testing has been previously mentioned, and such an examination is equally necessary after annealing and after retesting. One great advantage of periodical annealing is the opportunity offered for careful examination of the chain or other appliance, since, with the removal of all grease and dirt by firing, the bare metal is exposed. Some firms have their chains treated with a hot soda solution to remove the grease before annealing.

Crane chains are usually greased to facilitate working, and must be removed from the crane for

#### ENTRANCE MONTCLAIR CONGREGATIONAL CHURCH

This is finished in "Detageirav" limestone, quarried by the Reed Stone Company, Bedford, Ind., and supplied by Arlando Marine, New York. Cut by George Brown & Co., Newark. Architect, Bertram G. Goodhue. Builder, Charles T. Wills Co.

examination, but sling chains are not so treated, and if used under cover do not become rusty. Sling chains can, therefore, be frequently examined with facility, and though examinations are made from time to time by the slingers in most works, these are often perfunctory, unless a heavy load is to be lifted. Some firms have their sling chains carefully examined by a smith or other competent per-

son at frequent intervals, in some cases as often as once every week. The frequency of examination, like that of annealing, is generally determined by the nature and amount of work done by a chain, rather than by its dimensions. The more general adoption of frequent periodical examinations would, undoubtedly, lead to a reduction in the number of chain fractures and accidents resulting therefrom.

Examination of chains and other lifting gear should be made by a competent practical man conversant with the kind of flaws and defects likely to be found, and able to make due allowance for any wear or distortion when considering the safety of a chain or appliance. Though detection of minute cracks in the metal is often difficult, a fire test will facilitate their discovery, and should be applied, if possible, in cases of doubt. Cracks or flaws may generally be seen as somewhat dark patches when the metal is heated to dull red, and some expert smiths consider that internal defects in the welds are visible by this test. Whilst the article is hot, a little water sprinkled on its surface will help to reveal any crack extending to the surface.

No definite rules can be laid down for chain examinations, but the simple rule, "When in doubt, cut," already the practice of reliable firms of chain manufacturers, who always advise removal of doubtful links, can generally be adopted with advantage. Some chain users even give their men a bonus for discovering defective links in chains above a certain size.

All chains and appliances in use are subject to continuous wear, and the examiner must eventually decide when the wear is sufficient to render the chain or appliance unsafe for its normal working load. This decision is usually left to the experience and judgment of the examiner, who may in some cases refer any doubtful appliance to a foreman or manager. If a chain containing worn links is subjected to its normal proof load, and the worn links become distorted, as they generally do, they should be removed and replaced by new links.

Standards of permissible wear for lifting chains have been adopted by some firms, e. g., a reduction in diameter of the iron of  $1/32$  in. for chains up to 1 in. and  $1/16$  in. for chains over 1 in., but the general condition of the chain must also be taken into account. Wear up to 15 per cent. of the diameter of the iron is allowed in another standard, and even 25 per cent. wear when safe working loads corresponding to the reduced sizes are permitted.

The wear of a chain is often local, and the life of a chain may be extended by changing ends, thus subjecting another part of the chain to wear. For a chain in regular use this change can be made at definite intervals, and it is often advisable to replace the whole chain at the second change. Rather than run any risk of breakage, some firms replace certain

classes of crane chains every month. In other cases, the crane chains are replaced after they have lifted a certain tonnage; this is good practice, but the difficulty of recording the tonnage prevents its more general adoption.

The lifting chains of hand-pulley blocks, when they become worn, generally "ride" on the sprocket wheels and thus prevent the proper use of the blocks. Such chains should be renewed or the whole appliances sent to the makers for overhaul and repair.

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### America Leads Among the Slate Producing Countries

Next to the United States, Great Britain and France are the chief slate-producing countries, and Belgium ranks fourth. Other countries reporting an output of slate are India, Germany (Bavaria), and Canada. As all these countries were directly or indirectly involved in the European war during 1915, both their production of slate and their demand for slate doubtless greatly decreased. Canada's production, according to John McLeish, of the Canada Department of Mines, decreased from 1075 squares, valued at \$4,837, in 1914, to 397 squares, valued at \$2,039, in 1915.

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### Tests for Roofing Slate

The following test for roofing slates—to find whether they are good or otherwise—is given in the advanced text-book on Building Construction by Chas. & Geo. Mitchell. "Place one on edge to half its depth in water for twelve hours. If the water approaches the top of the slate it should be rejected; if it does not rise  $1/8$  in. it may be considered as practically non-absorbent. Another method is to weigh a well-dried slate, and after soaking for twelve hours in water to weigh it again; the difference in weight will show the quantity absorbed."

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### Marble Rates Reasonable

Rates on marble from New York and Baltimore to St. Paul, Minn., Knoxville, Tenn., and Kansas City, Mo., over the New York, Ontario and Western Railway are held by the Interstate Commerce Commission to be reasonable. Rates on stone to these points, however, were declared unreasonable.

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### To Build a Granite Mausoleum

President Thomas N. McCarter, of the Public Service Corporation, Newark, is building a granite mausoleum with bronze doors in the old Mance Cemetery, near his home in Red Bank, N. J. The building will cost about \$15,000.

### Trouble in Concrete Work

The causes of trouble in concrete work have been enumerated by the Kansas City Testing Laboratory in the order of their frequency, as follows: Lean mixtures containing too much water, too much sand or too much rock, giving a concrete or mortar of too low density. Such concrete sets up slowly, absorbs water and disintegrates with freezing. In finished work for floors the use of too much water or working after initial set has taken place in the mortar is the cause of dusting of the floors.

Freezing of mortar or concrete frequently gives the appearance of concrete that has been thoroughly set up. The strength of concrete or mortar while frozen is very nearly the same as the strength of concrete that has thoroughly set up, but while thawing it has practically no strength. Forms should never be taken off of concrete while it is at a freezing temperature. Abnormal temperatures if excessively high cause too rapid setting or too rapid drying out of the concrete, and if too low, delay the setting so that the concrete dries out or is subject to disturbance before the initial set has taken place.

Dirty aggregate is a common cause of weak concrete. Particularly is this the case with the rock that contains conglomerate of clay or shale, or laminated rock. Poor workmanship, allowing the segregation of the aggregate, and inaccuracies in the proportions and time of mixing and careless placing of concrete are the causes of much trouble in such work. Improper storage of cement or defective manufacturing yield poor cement.

Organic matter in the sand or water is an infrequent cause of poor concrete. Occasionally samples of sand are found that contain sufficient organic matter to prevent the proper setting of the mortar or of the concrete. These are usually bank or pit sand. River sands are rarely the cause of trouble on this source unless the water contains a large amount of sewage.

### Building of the "Boston Tech."

Some months ago we illustrated in these columns the great new home of the Massachusetts Institute of Technology, one of the finest examples of stone construction of recent years. Interesting facts concerning the work are given by a newspaper writer, who says: "Boston Tech's" new buildings upon the Institute's fine site on the Charles make its plant alone of great interest to the architect and engineer. The word "buildings" can be employed only in a liberal sense, for the school will be unique among those of its size in having all its departments and activities housed under one roof. That portion of the structure on the western half of the site contains the recitation rooms, shops, and laboratories; the portion on the eastern half the Commons, the Walker Memorial, the clubhouse, gymnasium, and athletic field. Of the view of the whole from the river the planners are especially

proud, and not the least of its merits is that it by no means seems the stupendously huge building it is—large enough to cover many solid blocks in Boston. The architects, for the most part Tech. men, assert that the coöperation by which the plant, equivalent to twenty-one buildings of considerable size on the average campus, was erected in two years and a half, sets a new mark in the history of the work of public building. Draughtsmen, structural engineers, heating and lighting engineers, electrical engineers, all labored at the same time for all of the units. One thousand men were put to work simultaneously, and material of different kinds was from the beginning delivered at the rate of one ton per minute.

### Depression in the Slate Industry

The causes of the depressed state of the slate industry in 1915 are largely but not wholly those that affected certain other industries during the year, writes G. F. Loughlin in a bulletin just issued by the United States Geological Survey. There was a general lack of demand attributed by the producers to inactivity in building operations, which extended throughout the country until late summer or early fall. Prices were not steady. Some companies, with large stocks on hand, sold their product at lower prices than have prevailed for ten years; and several companies, unable to withstand the severe competition and the increasing cost of labor and supplies, suspended operations. A few companies were affected by purely local conditions possible in any year, such as falls of rock and inadequate equipment.

For several years slate has suffered from competition with artificial roofing materials, which have been aggressively advertised, and from the increasing number of factories, dwellings, schools, and other buildings that have been built with flat roofs. Some slate producers complain that there is a general apathy on the part of slate companies in meeting these conditions; that inadequate advertising of slate is largely responsible for the inroads made by well-advertised artificial materials; and that the failure of companies to cooperate in promoting its development has allowed the slate industry to remain nearly stationary or to decline, while other competing industries have made substantial progress.

It has also been suggested that a failure to recognize a certain minimum thickness for slates has been unfavorable to the industry; that some producers are in the habit of splitting their slates too thin; and that the insistence by architects and the general public on thicker slates would result in much less breakage, a higher standard of splitting and sorting slates, and the marketing of a product of higher grade. The minimum thickness suggested is three-sixteenths of an inch for the strongest slates and fully a quarter of an inch for the common slates of somewhat less strength. The growing demand for thicker slates to produce

rough effects should assist in this development of the industry.

A few companies reported a successful year and a demand exceeding supply in 1915. These supplied markets in New York and the Middle Atlantic States, the same region in which depression was most keenly felt by the majority of producers.

Several producers reported that conditions began to improve during the last three months of 1915 and that prices for all kinds of slate early in 1916 were more encouraging than at corresponding periods for several years. The present condition of many quarries is such that they can greatly increase their output to keep pace with any increase in demand.

### **Iowa Planning a State Quarry**

The State Board of Control of Iowa recently purchased a tract of stone land in the northwest corner of Lyon county, about ten miles from Sioux Falls. The board contemplates the opening up of big quarries, and during the past month made an inspection of the property, accompanied by the state highway engineer, railroad men, and others.

There is a big outcropping of the rock on the board of control tract in Lyon county which can be stripped at comparatively low expense. It is thought that work can proceed right through the winter if a tunnel is blasted underground. There is a big demand for this rock, commonly known as Sioux Falls granite, as it is especially hard and highly desirable in paving work. It is also capable of taking a high polish and can be used in building operations. The board expects to sell the rock all through this state provided the freight rates are not too high. Convict labor will be used at the quarry.

The board will be required to put in considerable machinery and to erect some cheap buildings at the quarries. Spur tracks will probably be put in by both the Illinois Central and the Rock Island railroads without expense to the state. Inasmuch as there is such a demand for this hard rock for building purposes and especially for paving the board believes it can carry on an extensive business at good profits to the state.

### **No Shortage of Granite but Lack of Adequate Transportation**

A statement comes to us that many orders for markers and monuments are unfilled because of a shortage of granite,' says the *Cemetery Beautiful*. We have no doubt that there are unfilled orders and the inquiry is natural why this should be so, but the reason assigned to our correspondent by the local dealer is not correct.

The delay is caused rather by a shortage of skilled labor and slow freights. The sale of granite for many purposes is very large this year and there have been strikes and labor troubles in some of the granite cut-

ting centers. The congestion of freight is a matter of public knowledge. The usual condition is reversed and instead of there being thousands of idle freight cars as is commonly the case there is in every city and shipping point an accumulation of freight waiting for cars in which to ship it.

The business of the country is suffering from a lack of shipping facilities; of labor and in some cases of material, but not of granite. The supply is ample for the most excessive requirements for ages to come. Besides the present quarries, which are nowhere near exhaustion, there are many parts of the country where there is fine stone to be had with better shipping facilities and some development work.

### **Meerschaum Used as a Building Material in a Spanish Town**

Even the most aesthetically inclined of our American millionaires would hardly consider the luxury of living in a palace built of meerschaum as within the range of their fortunes, yet there are many unpretentious houses of this material in the Spanish town of Vallecas, near Madrid, where a coarse variety of this substance is to be found. On the other hand, the Moroccans, just across the Straits of Gibraltar, find that still another variety of meerschaum lathers freely and they use it, perhaps sparingly, as a substitute for soap.

The chips and sawdust of the meerschaum pipe factories make an excellent cleaning powder for removing stains from costly fabrics. An inferior pipe is also made from these scraps, the fragments being bound together with some solution and then molded into blocks.

Meerschaum is found in Greece and in Hrubshitz, Moravia, as well as in Asia Minor, and to a limited extent in Pennsylvania, South Carolina and in the upper Gila valley, near Silver Lake, N. M.

### **The Rebuilding of Dublin**

The Council of the Royal Institute of the Architects of Ireland, in connection with the question of the rebuilding of the late destroyed areas of Dublin, has passed the following resolution: "That the Government should embody in any Bill dealing with the rebuilding, 'power to acquire in the Sackville Street area all the sites of the destroyed property, and, where necessary, those of the premises adjoining, and to redistribute these sites, define the boundaries, and control the designs.'" A letter has been received from the Architectural Association of Ireland expressing its approval and general adherence to the terms of the resolution adopted by the Council dealing with the desirability of imposing conditions or restrictions with regard to the design and reconstruction of buildings in important thoroughfares, so that they shall conform to some general scheme of street improvement.



# STONE

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INDUSTRY IN ALL OF ITS BRANCHES

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MENTION was made last month of the peculiar legal difficulties involving a Western lime company that had conducted business under a firm name. Through oversight the company had neglected to pay its corporation tax, and its franchise was automatically forfeited. Thereupon several enterprising people, none of whom had a name even remotely suggesting the name of the derelict company, formed a corporation with a paid-up capital of \$30, and boldly appropriated the name. The old company, which offered to pay its back taxes with interest, is now made defendant in injunction proceedings, the new concern asking the court to prevent the directors of the old company from using the name they have heretofore used, or using any other name "so closely resembling it as to tend to deceive." Inasmuch as the name in question is that of the founder of the business, it would seem a rank injustice if his legitimate successors were restrained from using it, while it is purloined by any chance promoter. A short time ago there was a case in New York City where a famous and valuable firm name was appropriated by individuals having no just claim whatever to it. In this instance, however, the courts issued an injunction restraining such an unwarranted use of the name.

THE city of Detroit has a Builders and Traders' Exchange, which has just opened a permanent building exposition. Among the exhibitors are the various cut stone contractors and marble workers of the city, who show various samples of their handiwork. There is no doubt that such an exposition as this will have an excellent influence and will serve to induce architects and building owners to make a wider use of the choicest materials of construction. The makers of cheap imitations and substitutes miss no opportunity to exploit their wares, and the producers and workers

of natural stone should be equally enterprising. A building exposition affords an excellent chance to show the superiority of stone over any man-made imitation. The stone trade seems to have taken for granted that the general public is familiar with the nature and capabilities of stone. As a matter of fact, it knows very little of the subject. Even a large proportion of architects has a surprising ignorance as to the different varieties of stone, and is unable to distinguish between them. We trust the time is not far distant when every large city will have a permanent exhibition of this kind, containing a full and representative collection of building stones, showing the different styles of finish. It would be educational, and what is more, it would help toward an improvement in our constructional work.

## Utilization of Waste

In many lines of activity the utilization of by-products has meant all the difference between success and failure. From the very nature of quarrying operations there must of necessity be a considerable proportion of waste. Veritable mountains of waste rock are to be found in many of the quarrying centers, ranging from huge blocks to mere spalls. In former years little effort was made to turn this material to any useful purpose. Not only did it entail constant expense for handling, but as the accumulation grew it seriously interfered with quarrying work. We do somewhat better now. The making of paving blocks, the production of crushed stone, the burning of lime, the grinding of limestone for fertilizing purposes, and the manufacture of sand-lime bricks, all use up much of what was formerly a mere waste, and have turned a heavy expense account to the profit side of the ledger. During the past few months one of the largest marble companies in the world has been constructing a battery of lime-kilns with the idea of using up the waste accumulations of a century.

Although so much has been accomplished along this line, a hopeless achievement so far has been the attempt to find any use for slate waste. The unfortunate part of it is that there is far more waste here than in any other form of quarrying. Perhaps the average proportion of waste is from fifty to sixty per cent. of the total amount of slate rock raised, and it frequently runs much higher than this. A recent writer in the Welsh press takes up this question, and makes one or two pertinent suggestions. He has noticed that slate dust after several years of treading down in the sheds gets as firm as a rock, and hints a possible solution in the solidification of particles with a view to the manufacture of bricks and tiles. Then he suggests that the quarry proprietors offer sums of money for the establishing of laboratories to make exhaustive investigations, or the formation of a fund for the offering of a scholarship at the University College of North Wales.

Commenting upon these suggestions, the *Slate Trade*



*Gazette* says: "We think the former idea is much to be preferred to the latter. The first course would mean concentration and thoroughness, the second amateurism and dilettantism. 'Varsity courses are too largely academic. They are marred by too much theory and too little practice. Hitherto we have been teaching for the specific end of culture and refinement, and not for the purpose of making the most of our resources. We shall always contend that the primary object of our educational system should be to increase productiveness, and until this ideal is set up we shall refuse to believe that 'varsity methods would be helpful to the slate trade. If research work is to be undertaken, we think that the trade would be wise to eschew the mere dabbling associated with school methods, and ensure deep and thorough investigation by taking the business into its own hands. The experiment would, of course, involve expense, but apportioned equally this should be no great burden. At the worst the loss would be trifling; at the best, the gain would be incalculable."

The slate quarrymen of the United States are spending hundreds of thousands of dollars every year for the handling of waste. If they should offer a good big prize, say \$25,000, either for some method to cut down sensibly the percentage of waste or to utilize it profitably, we are confident that the problem would soon be solved. But they seem to be waiting for some one to carry on the necessary investigations and experiments at his own expense, and then make a free donation of his discovery.

### Exportation of Inferior Slate and Loss of Foreign Trade

The exporting of roofing slate from this country has steadily decreased in recent years. According to figures issued by the United States Geological Survey, the value of exports of slate dropped from \$226,413 in 1913 to \$46,137 in 1915, the lowest recorded since 1895. We have hinted on former occasions that one reason for this falling off might be that our slate producers had sent inferior stock abroad, a complaint that has been made to us in person by foreign slate dealers. That there is something in this charge is indicated by an article in the *Master Builders' Journal*. The Welsh correspondent of that paper writes as follows:

The prohibition of the import of foreign slates and slabs, although generally recognised as a step in the right direction in freeing overburdened shipping from carrying unnecessary tonnage, has, as expected, been criticised by agents of foreign slate quarries. It would have been well for Welsh slates if the prohibition had been put into force at a much earlier period, as the inferior quality of foreign slates, frequently passed off as Welsh, very greatly damaged their reputation. Many houses, particularly on the South Coast, which have been covered with foreign slates are in a

disgraceful condition, and so long as Welsh slates (which are British in material as well as in manufacture) can be obtained at a reasonable price, the prohibition of foreign slate imports is the best thing that could have happened in the interests of the community.

This is not to say that there are no good slates quarried abroad, but they are nearly always retained in the country of their origin. Some years ago, the writer of these lines being in the United States, took occasion (on the principle of the tramcar man who spends his holiday in riding on another tramcar) to visit some of the American quarries. At one of them he ventured to remark that some of the slates were of inferior quality, whereat the manager explained with evident satisfaction that they were "the slates which we send to your country." One of the largest exporters of foreign slates is a German firm, who, before the outbreak of war, exported to this country slates which were cheap and nasty, while all the time importing into Germany the very best slates the Welsh quarries produce. It is to be hoped that in the future England will see the quality will have some consideration over mere lowness of price, then as roofing material, Welsh slates will regain their paramount position.

### Building Cottages of Mud

The Household and Social Science Department of the King's College for Women, London, is making an experiment in the use of mud as a building material for cottages in the grounds of the College at Campden Hill. Mr. St. Loe Strachey had already run up a mud building on his estate in Surrey which cost \$60 as against \$400 if more orthodox material had been used. The King's College test is intended to carry his experiment a little further, and to ascertain whether the use of mud as a building material is practicable in the British climate. Six mud walls have been erected at Campden Hill. The first one is merely earth which had been subjected to pressure between wood; but in the case of the second soft soap has been added to the earth. The third wall is of earth, soft soap, and lime; the fourth has a "grouting" of cement over the "mud"; while the fifth has been dressed with tar; and the sixth is constructed of a mixture of earth, water glass, and lime. A careful watch is being kept by the students on the six walls, and so far the one treated with tar has, it is thought, proved the most successful.

### Carving for the Pittsburg Arcade Building

One of the most elaborate examples of carved building work intended for business purposes now in course of construction is the Union Arcade in Pittsburg, which is being erected by Mr. Frick. On the façade are 56 corbels, all most delicately carved. A force of six or more gifted sculptors is now at work on this ornamentation. In addition to this work, there

is elaborate tracery for the windows. It is expected that the finished structure will be one of the finest mercantile buildings of its size in the country.

### Government Work

Congress has appropriated \$75,000 for an addition to the postoffice at Macon, Ga.

The Lighthouse Inspection of the Milwaukee district will purchase riprap stone.

The Supervising Architect's office, Treasury Department, Washington, D. C., is preparing plans for a new postoffice at Charlottesville, Va. The estimated cost is \$65,000.

The contract for the new postoffice at Middletown, Conn., has been awarded to W. H. Fissell & Co., New York, at \$100,900.

The contract for the new postoffice at South Boston, Va., has been awarded to the Newport Contracting & Engineering Company, of Newport News, at \$42,488.

The government has let the contract for the postoffice at Alliance, O., to Robert Mellor, of that city, at \$94,500, and the contract for the postoffice at Alliance, Neb., to George A. Schaul, of Seneca, Kans., at \$56,996.

The government has rejected all the bids for the construction of the new postoffice at Boise, Idaho.

G. Fee, of San Francisco, Cal., has been awarded the contract for the construction of the new postoffice at Douglas, Ariz., at \$77,000.

Bids will be received until August 11 for the construction of the new postoffice at Burlington, N. C., and until August 16 for the postoffice at Newark, O.

Bids will be received by the Supervising Architect, Treasury Department, Washington, until August 7, for the construction of the new postoffice at Portland, Ore.

The Lighthouse Inspector, Buffalo, N. Y., will receive bids for furnishing and placing approximately 1,400 tons of riprap stone around Toledo Harbor Light Station, Ohio.

### New Companies

Emerald Granite Company, of Boston, Mass., to manufacture and deal in granite. Capital, \$60,000. Incorporators: Stephen Bianchi, Joseph W. Berry, William M. Shaughnessy.

Superior Sand & Gravel Company, of Logansport, Ind., to quarry and deal in sand, gravel etc. Capital, \$100,000. Incorporators: John H. Barnhart, Henry P. Barnhart, Michael W. Murphy.

The Chico Crushed Stone Company, of Chico, Tex., to quarry and crush stone. Capital, \$25,000. Incorporators: J. W. Barnett, R. L. Morris, Arthur S. Goetz.

Marble Supply Company, of New York, to deal in marble, granite, onyx, etc. Capital, \$10,000. Incorporators: W. J. Lamey, D. U. Smith, G. C. Robinson, 1269 Broadway.

The Riverside Stone Company, of Fremont, O., to quarry and deal in stone. Capital, \$15,000. Incorporators: J. W. Forsythe, J. W. Pero, Chester A. Culbert, W. O. Fregelist, R. A. Hunsinger.

Amherst Granite Company, of Portland, Me., to deal in granite, marble and all kinds of building and paving stones. Capital, \$10,000. Incorporators: Philip G. Clifford, George E. Fogg, Joseph E. Chase, Portland.

Myers Gravel & Sand Company, of Anderson, Ind., to quarry sand, gravel, etc. Directors: Joseph P. Myers, Frank Myers, Linfield Myers.

Seneca Lake Limestone Corporation, of Geneva, N. Y., to operate limestone quarries, etc. Capital, \$10,000. President, Calvin J. Huson; directors, Harry E. Cole, Albany; George G. Goodelle, Geneva, and E. M. Stanton, Fayetteville.

Schreck & Wetter Monument Company, of Louisville, Ky., to manufacture and deal in marble and granite. Capital,

\$2,000. Incorporators: William A. Wetter, Peter J. Schreck, Simon J. Schreck.

Oley Valley Quarry Company, of Reading, Pa., to quarry and deal in stone. Capital, \$7,500. Treasurer, J. H. Bucher, Boyertown.

Thurlow Stone Company, of Chester, Pa., to quarry and deal in stone. Capital, \$5,000. Treasurer, Richard B. Turner, Chester.

National Crushed Stone Company, of Waterloo, Ia., to quarry and crush stone. Capital, \$40,000. President and treasurer, J. A. Green, Jr.; secretary, J. T. Lennan.

The Greenfield Stone Company, of Greenfield, O., to quarry and deal in stone. Capital, \$50,000. Incorporators: Harry L. Gordon, Walter M. Beinhart, Joseph F. Rielag, Edna M. McDonald, Michael G. Heintz.

Shaw Marble & Tile Company, of St. Louis, Mo., to do a general marble and tile business. Capital, \$25,000. Incorporators: Louis M. Brohammer, Dietrich Hedenkamp, Joseph B. Gander and others.

The Hamburg Quarry Company, of Hamburg, St. Charles County, Mo., to quarry and deal in stone. Capital, \$2,000. Incorporators: Thomas Lonergan, James E. Rutledge and John J. Helfer.

Clark Marble & Granite Company, of Crawfordsville, Ind., to manufacture and deal in marble, granite, etc. Capital, \$10,000. Directors: Lewis C. Willis, Louis O. Clark, Harry E. Negley.

The Marquette Green Marble Company, of Detroit Mich., has decreased its capital from \$500,000 to \$250,000.

The East Tennessee Marble Company, of Knoxville, Tenn., has changed its name to the Thrasher Marble Company.

### Quarry Notes

The town of Moravia, Cayuga County, N. Y., has purchased a stone crusher, but has found it impossible to get the raw stone for crushing. There is a quarry of suitable stone within the township limits, but the officials declare that the owner asks a prohibitive price for the product.

The Department of Public Works of Syracuse is obliged by law to buy crushed stone from the Onondaga County Penitentiary as long as that institution can furnish it. At the present time the output of the penitentiary is needed by the county highway department and the city will purchase its crushed stone supplies in the open market.

The enormous demand for crushed stone following the goods roads' movement has made very profitable some of the hill farms in northeastern Iowa, considered nearly worthless for agricultural purposes. The stone in the hillsides is of high grade and particularly well suited for surfacing roads. The Sawvell Brothers, farmers of McGregor, have organized the McGregor Stone Crushing Company, to operate on twenty-five acres of hitherto valueless land at Bloody Run. A crushing plant has been installed, operated by electric power, and large shipments have already been made. The fine screenings are sold for fertilizing purposes, but most of the output is road metal.

The refusal of the railroads to construct a switch to the property in Lyon County, recently purchased by the Iowa State Board of Control, for the purpose of opening a stone quarry to be operated by prison labor, will prevent the State from starting the new industry before 1917. The State board will probably ask the next general assembly for an appropriation of \$30,000 to put in the required switch in Lyon County. The State expects to use the quarry property to get out crushed stone for road work. Buildings will be erected at the quarry and the property put in shape for operation by gangs of honor prisoners sent from the penitentiary at Anamosa.

## Ramp-on-Twist Stone Steps

**A**N important and not infrequent problem in the laying-out of stonework is shown in the accompanying illustrations. Fig. 1 shows the plan, and Fig. 2 the elevation, of a ramp-on-twist stone wall, ascending from a lower terrace to one at a higher level. The example is from the *Building World*, of London.

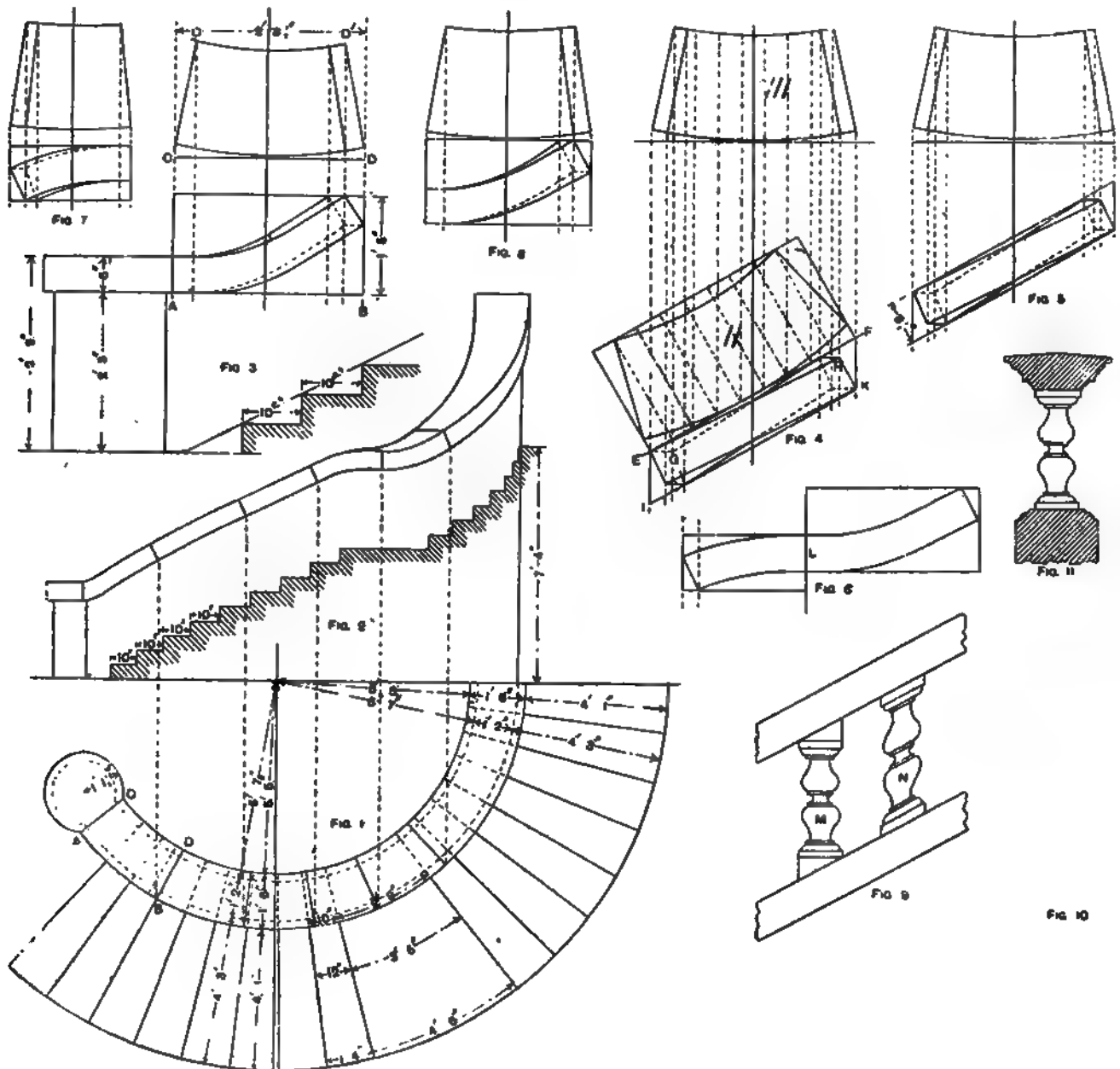
The first important point in connection with setting out the plan is to find the radius of the concave and the convex face-lines of the wall. As shown on the plan, the first concave radius is 5 ft. 7 in.; the width of the wall, 14 in., gives the convex radius 6 ft. 9 in.; and the length of the steps to the extreme concave line being 4 ft. 3 in. clear between wall and wall, gives the radius of the extreme concave wall line, 11 ft.

The next consideration is the altitude from the datum or ground line to the highest point, which, as shown in Fig. 2, is 7 ft. 4 in.; and the distance to be traversed on the going line is 18 ft. 5 in. This distance is apportioned between fifteen steps and one landing as shown on plan (Fig. 1), each of the steps covering a space of 12 in. on the going line, and 3 ft. 5 in. on the landing.

The dimensions are found by the following method: Take one-third of the length of the step from the convex face of the wall and the projection of the capping inclusive; then from the radius point on the plan take the radius—namely, 6 ft. 9 in. One-third the length of the step from the convex face line will be 1 ft. 5 in.; this, added to 2 in. for the projection of the capping, makes 1 ft. 7 in., which, added to 6 ft. 9 in., will give a radius of 8 ft. 4 in., which, struck round on the plan, will form the going line—in this case representing 12 in. going.

The going of each step and landing having been thus ascertained, the next proceeding is to draw from the radius point on the plan each step as shown. Mark the 12-in. going of each step and the 3-ft. 5-in. landing on the divisional line, and draw radiating lines from the striking point on the plan. As indicated by dotted lines, each line is continued through on the width of the capping in order to obtain the convex and concave face moulds. It is the custom to introduce a rest landing as shown on plan (Fig. 1) where practicable, in order to make ascent easy.

The going having been fixed—namely, 12 in., the risers will



be found to work out at  $5\frac{1}{2}$  in. each step and landing. The relative proportions of tread and riser conform to the recognized rule according to which the breadth of the tread, multiplied by the height of the riser, produces the constant 66. Here 12 in. (tread) by  $5\frac{1}{2}$  in. (riser) = 66.

It will be further noticed from the plan that each step covers, at the line of intersection with the walls, 10 in. at one end and 1 ft. 4 in. at the other. In taking out the quantities, the width on the tread should be measured midway of the length of the step and multiplied by the thickness in order to find the cubic contents. The landing covers, at the small end of intersection with the wall, 2 ft. 9 in., and at the other end 4 ft. 6 in.

The lengths of the various stones are shown on the plan. Fig. 2 shows the elevation as projected from the plan, and supplies all the requisite dimensions. Fig. 3 shows the newel stone and the first length of capping, with the pitch line on which any determined length of capping is set. The outside and inside face moulds, for the convex and concave faces respectively, are also shown. To obtain the exact length of the face moulds, the convex face on plan or bed mould must be stepped round with compasses and divided into any number of equal ordinates, which are then marked off on a straight line, as *c d*, from the centre line on each side.

The face mould in this instance develops  $\frac{1}{2}$  in., but the quicker the sweep the greater the development. In this figure the newel cap is, for the sake of simplicity, jointed at the intersection of the two radii, as from this joint the capping begins to twist, while the newel cap is out of twist and perfectly horizontal on its bed.

The centre line must be strictly adhered to in applying both bed moulds and face moulds. Now take the top bed perfectly out of twist, then mark on the bed moulds the joint lines and centre lines, as *c d* and *c' d'*. Then work the stone to the parallel height required. Square down joints *c d* from the top bed and centre line. Then mark the bed mould on the bottom bed to the points squared down; work both convex and concave face through, also the joints where advantageous.

In applying the two face moulds, special care must be taken to get the two face moulds level on the radius line. The top bed is worked off to the face mould and section, but the bottom line is sunk back to an ashlar face, and jointed to suit the bond of the work below.

This system of working is on what is termed the level-bed principle. It involves considerable waste of material and labor in working the capping on the top bed to a sharp pitch. In the system illustrated by Fig. 4, however, a developed bed mould may be obtained without undue waste. A bed mould mark /// represents the second stone, which is to be divided into any number of equal parts, these divisions being laid down on the pitch line as at *e f* (Fig. 4). These points are then squared back on the bed mould as marked // and over the vertical lines at *e f*. The same mould will serve for the bottom bed at *i k*.

When applied to these vertical lines, two faces must be worked through, keeping the line of chisel draughts vertical, either by using a shiftstock or by drawing the face mould round and using joints *i e* or *k f* for vertical lines. The position of the inside face mould is indicated by dotted lines at *g h*.

Fig. 5 may be worked on the level bed system, or as Fig. 4, at discretion. Fig. 6 shows the developed ogee face mould over the landing for convex face; the stones (Figs. 7 and 8) required are the same in size as those jointed at *L*, and they may be worked on the level bed system in each case.

Fig. 9 shows an elevation of the balusters used on ramp-on-twist walls. From the example *m* it will be seen that the moulding is worked so that the balusters, when fixed, shall be perfectly horizontal—that is to say, stoolings must be left both

at top and bottom to receive the balusters. The example *n* is worked parallel to the line of pitch.

Fig. 10 shows an elevation of the baluster as sawn. The baluster is worked and squared up to the size required, and the beds are worked through at *o* and *p*. To obtain the twist of the beds, drop down on inside face from the level bed to the same depth on the radiation line as the outside face.

Fig. 11 shows baluster, sections of plinth, and moulded capping, which need no further description.

## Notes from the Stone Fields

### MARBLE AND GRANITE

What is considered to be one of the largest blocks of marble ever quarried in the United States was "tipped" at the quarries of the Mount Nebo Marble Company, in Utah, a few weeks ago. A block weighing 450 tons was removed from the face of the cliff to furnish marble for the interior decorations and the monoliths to be placed in the main reception hall of the Mormon church administration building, at Salt Lake, which is nearing completion. It is estimated by the engineers in charge of the work that twice as much marble is contained in the block as will be needed for the filling of the monolith contract.

A fine shaft of Massachusetts granite has just been erected in Topeka cemetery by the Topeka Typographical Union.

The last of the granite work has been set in the new front of the Schenectady Trust Company's building, at Schenectady, N. Y. About 120 tons of granite were used in the job.

There has been a strike of negro laborers in the granite quarries at Lithonia, Ga., throwing out of work about 500 white granite cutters. The latter signed a new five-year scale at \$4.00 a day some time ago, but the strike of the negro laborers put a stop to all work.

An exchange building, costing \$100,000, will be erected at the Union stockyards in Portland, Ore. This will be elaborately finished in marble and will have a marble circular stairway. The architect is Lewis I. Thompson, of Portland.

The Texas & Pacific railway station at Fort Worth, Tex., is to be rebuilt. One of the features of the interior will be fine marble columns that will replace the present unsightly pillars.

The granite quarry at Port Deposit, Md., operated for many years by the McClenahan Granite Company, has recently passed into the hands of F. T. Benson, W. P. Cameron and Charles Morrison, of Port Deposit, and will be operated by these gentlemen.

It is expected that the granite work on the new public library at San Francisco will be finished in August, and that the building will be ready for occupancy by the first of the year.

P. F. McCormack, one of the heads of the Clarendon Marble Company of West Rutland, has bought the Kent & Root property of 60 acres at South Dorset. Through it runs a vein of light variegated stone. There is an old dam on a branch of the Battenkil river which runs through the site and Mr. McCormack is installing a water wheel and generator, expecting to develop water power. He will begin soon taking blocks from the quarry which has been unused for a quarter of a century. The tract cost approximately \$20,000.

The Central Savings Bank of Detroit will erect a new branch building at Woodward and West Forest avenues in that city. The interior will be finished in Vermont marble.

The granite quarry operators near Porterville, Cal., have had a conference with the officials of the Southern Pacific

railway and expect that a branch line will be constructed from Adobe north to the quarries. This would also tap the orange orchards in the Monache district.

The Chamber of Commerce of Temple, Tex., has reported favorably on the proposition to establish a marble finishing plant at that place. The sentiment, however, seems to be for a smaller plant to begin with than that suggested by the Green Marble Company, which would involve an outlay of over \$100,000.

The Great West Marble and Granite corporation, a new South Dakota corporation, has purchased the marble and serpentine quarries located about six miles northeast of Custer. The company also owns large holdings of granite quarries near Nemo, and does a wholesale business in

marble originally placed did not measure up to the requirements of the specifications.

Mariner & Tupy is a new firm that has just been incorporated at Sioux City, Ia., with a capital of \$25,000, to manufacture and deal in marble, tile, slate and terrazo. The company will erect a plant 150 by 75 feet, with a complete equipment.

The granite industry in West Cornwall, Eng., is seriously affected by the closing down of several large quarries belonging to the firm of Messrs. Freeman, Son & Company. One of the quarries usually employed 90 men, and another 50 men. At least four other quarries in this district are shut down.

The Bureau of Yards and Docks, Navy Department, has awarded the contract at \$85,000 to the Stone Mountain Granite Company, Stone Mountain, Ga., to furnish the granite that will be required in the construction of the new marine barracks at the Portsmouth, Va., navy yard.

The Wolf Granite Works is moving all of its granite machinery to the Fox River Granite Works on Lawe Street, Appleton, Wis. The two companies hereafter are to be known as the Appleton Marble & Granite Works. The Wolf Granite Works will still continue to be in existence for office purposes, and for finished material. The Fox River Works will receive all the raw material and make the finished product.

The McGilvray Raymond Granite Company has established an office and yard in Los Angeles, and will handle granite from their Raymond quarry and cutting yard, and sandstone from their quarry and yard at Colusa. This company furnished the sandstone for the Wilcox Building, Second and Spring streets, Los Angeles. The work of this firm has largely been in the vicinity of San Francisco, their latest job being the new granite City Hall, costing for the stone alone over \$1,500,000, the largest granite contract ever let in California.

Work in the quarries at Ableman, Wis., is practically at a standstill at present but it is expected that business will revive later in the season.

#### LIMESTONE AND SANDSTONE

The Indiana Quarries Company has removed its New York office to the Foster Building, 280 Madison Avenue, where it will occupy suite 306-307.

The J. Hoadley & Sons Co., Inc., whose mill at Stinesville, Ind., was burned some time ago, are now located at Bloomington, where they have a larger and better equipped mill than ever. They are now situated so that they can handle promptly building orders of any size. All inquiries in the future should be addressed to them at the Bloomington address.

Discoveries of extensive deposits of limestone and silica in the Philippines have led to the formation of a company to manufacture cement there.

A limestone quarry which is about a mile long, picturesque in appearance, and dangerous to work in, is located near Rockland, Me. There 300 laborers, chiefly foreigners, toil in chasms having perpendicular sides 500 feet high and no way of entrance or egress except by means of the derricks, which hoist and lower about a dozen men at a time. Approximately one million barrels of lime are prepared in the vicinity of Rockland annually.

The stone cutters of Portland, Ore., are urging the local congressmen to make every effort to have the new postoffice in that city built of Portland sandstone.

The limestone quarries of Ohio County, W. Va., have furnished 12,000 cubic yards of stone for road building so far this year, but the county commissioners want 10,000 more yards.

The majority and minority interests in the National Limestone Company, which failed recently, are endeavoring to get

#### CAPITAL IN CHOIR, PLAINTIFFED CHURCH

Interesting stonework in an eleventh century French church.  
From a sketch by J. Tavenor Perry

monument and building stone, with branch establishments in several large cities.

The Security National Bank is erecting a new building of granite on Spring street, Los Angeles. The entire front including the cornice, is to be of carved and polished granite. There will be eight large columns of solid polished granite, each thirty feet high and three feet in diameter. The principal feature will be the effect of solid mass and deep reveals. The F. O. Engstrom company is the general contractor; John Parkinson, architect. The granite is being furnished by the Rockport Granite company.

The David Farnum Read Memorial Chapel at Bridgeport, Ct., has been completed. The exterior is of granite, and the interior is elaborately finished in marble and bronze. The architect was Donn Barber, of New York.

The Italian bark Gaspare arrived in Baltimore the past month with a cargo of marble blocks and statuary, consigned to the Hilgartner Marble Company, of that city.

James M. Johnson, associate justice of the Kansas City Court of Appeals, who is a candidate for the Republican nomination for justice of the Missouri supreme court, was, prior to 1884, when he was admitted to the bar, a marble cutter by trade.

The Wisconsin Granite Company has just opened a new granite quarry at Abelman, Wis. The product will be used largely for paving blocks.

The new Amoskeag bank building at Manchester, N. H., is being relined with marble, it being claimed that the

together with the view to operating the immense quarries in Berkeley County, W. Va.

The final shipment of 2,000 tons of stone from the quarries at Sturgeon Bay, Wis., has been made for the completion of the breakwater at Manistee, Wis.

#### SLATE

A strike of employees of the slate quarries in the Middle Granville district of New York was ended during the past month. The operators agreed to the demands of the men, and work was resumed at all of the plants. During the shut-down a gang of thieves raided a number of the plants and stole brass fittings from the machinery.

Having regard to the great difficulties which surround the trade—the scarcity of tonnage, dearth of freights, delays of railway transit, and almost total stoppage of house building—it is surprising how good is the demand for Welsh slates, writes a correspondent of an English journal. Nearly all the quarries are now working full time, but they are considerably hampered by the depletion of labor, and it is doubtful if any other industry has furnished so large a proportion of men for the army and munitions, as the slate quarries of North Wales.

#### Business Brevities

The Columbia Granite and Dredging Company of Washington, D. C., has just put a new power launch into commission. This will be employed in towing stone-laden lighters from Georgetown to points on the Eastern branch that cannot be reached by the Columbia Granite and Dredging Company tugs, their smokestacks not allowing them to go under low bridges.

The city commission of Omaha pledged itself to a one mill tax levy towards the erection of a monument in memory of Lincoln, the soldiers and sailors of the nation, and the pioneers of Nebraska. It has been found, however, that the location and design of the memorial must be definitely fixed before such a levy can be made legally, and the matter will therefore have to go over until next year.

The Waco Quarry Company of Waco, Tex., has filed a certificate of dissolution.

The stone work on the west wing of the State Capitol at Cheyenne, Wyo., has been finished. As soon as the roof is completed, the stone work on the east wing will be started.

The owners of stone quarries at Meadow, near Omaha, have complained to the Nebraska State Railway Commission that the Rock Island Railroad is not giving them sufficient cars to ship their product. It has been understood that the sand and stone dealers were to be given an even chance on the cars, but the latter claim that they did not get their share.

The city of Helena, Montana, has established a municipal rock pile, where the prisoners in the jail will be worked during the summer. The reason given for the action is that the city has grown to be a favorite place for the gathering of tramps.

Fred H. Hirth, of Grand Rapids, has been awarded contracts for the cut stone for a church at Yale, Mich., another at Muskegon, Mich., and also for a large furniture factory at Grand Rapids.

The Marietta Stone Company, of Marietta, O., has increased its capital stock from \$10,000 to \$100,000.

The 500 employees of the Ohio Quarries Company, at Amherst, O., have been given a general increase of 10 per cent. in wages. All of the quarries have been somewhat handicapped for lack of sufficient help.

A monument for the grave of Sarah Lincoln Grigsby, a

sister of Abraham Lincoln, has just been erected in Nancy Hanks Park, at Lincoln City, Ind., where Lincoln's mother is buried. The monument is a plain granite shaft.

W. S. Piggins Sons, Inc., of Detroit, has been awarded the contract for the cut stone work for the German-American Bank building at Hamilton Boulevard and Webb Avenue, Detroit. The company also has the contract for cut stone for a new apartment building on East Canfield Avenue.

The contract for the cut stone for a new convent at St. Paul and Parkview Avenue, Detroit, has been awarded to the Northern Stone & Granite Company, of that city.

The Christa Marble Company, of Detroit, has been awarded the contract for the marble work in a new apartment building on Henry Avenue, in that city.

The Shaftesbury Rural District Council, of England, after reciting the deplorable condition of the roads within the district area, has urged the War Office to "take im-

#### TOWER OF WROTHAM CHURCH, KENT, ENGLAND

A large and spacious medieval building still in good preservation

mediate steps to utilize some of the German prisoners now in the country by the establishment of detention camps near the quarries and quarrying sufficient stone to last for several years."

The Upper Hudson Stone Company, of New York, has increased its capital stock from \$600,000 to \$750,000.

The city of Bangor, Me., will get 5,000 cubic yards of stone from the new crushing plant which is being completed at East Hampden.

The Capitol Hill Monument Company, which was compelled to abandon its property at Des Moines, Ia., to make room for the capitol extension, is erecting a new plant at East Seventh and Raccoon streets, in that city.

#### Construction Notes

The University of West Virginia will erect new college buildings at Morgantown at an estimated cost of \$200,000. The plans are by Paul A. Davis, 1713 Sansom Street, Philadelphia.

The contract for the new buildings for the University of

California at Riverside, Cal., has been awarded to the Cresner Manufacturing Company, of that place, at \$99,829.

Newport, N. H., is planning the erection of an \$85,000 high school.

The city of Macon, Ga., has voted a bond issue of \$100,000 for a hospital and \$100,000 for an auditorium.

The Antler Realty Company will erect a nine-story apartment house, costing about \$200,000, at 145-149 East Forty-ninth Street, New York. The plans are by George and Edward Blum, of this city. The base and entrance will be of marble.

Peterboro, N. H., expects to erect a new town hall, costing about \$60,000.

The Presbyterian congregation of Santa Barbara calls for bids for a new \$100,000 church about August 1. The plans are by Roland F. Sauter.

The contract for the Thirteenth Church of Christ, Scientist, on Longwood Drive, Chicago, has been awarded to R. S. Wood & Co., of that city. The structure will cost about \$60,000.

R. Clipston Sturgis, 120 Boylston Street, Boston, is preparing plans for a \$50,000 high school for Proctor, Vt.

Charles W. Wright, of Lynn, Mass., has been awarded the contract for a \$140,000 school in that city.

The Fifth Avenue Baptist Church, of Huntington, W. Va., will erect a \$100,000 church building after plans by W. A. Hunt, Chattanooga.

Charles A. Dieman & Co., Cedar Rapids, Ia., are preparing plans for a \$100,000 high school for Carroll, Ia.

The Gresham Realty Company will erect a fourteen-story apartment hotel on Seventy-first Street, near Amsterdam Avenue, New York. The plans, by Emery Roth, call for a building in the French Renaissance style, of limestone, brick and terra cotta. The estimated cost is \$400,000.

The Otto Nelson Company, of Bangor, has the contract for the erection of a \$75,000 bank and office building at Sanford, Me.

The Y. M. C. A. of Rhinelander, Wis., will erect a new building after plans by H. F. Liebert.

Dodge County, Neb., will erect a \$100,000 courthouse at Fremont.

Seminole County, Okla., is discussing the advisability of erecting a \$100,000 courthouse at Wewoka.

Boring & Tilton, New York, are preparing plans for a new hospital at Norwalk, Conn.

George E. Savage, Witherspoon Building, Philadelphia, is preparing plans for a new church building for the Parkside Methodist Church, of Camden, N. J.

The Candler Holding Corporation will erect a thirteen-story apartment house on Edgecombe Avenue, near 150th Street, New York. It will be of limestone and brick, and the estimated cost is \$600,000. The plans are by Schwartz & Gross, N. B. Marcus, associate architect.

Key West, Fla., is planning the erection of a \$100,000 high school.

H. D. Gilchrist, Frick Building, Pittsburgh, is preparing plans for a \$150,000 school at Sewickley, Pa.

A new training school will be erected at the State Normal School at Bowling Green, O. The plans are by Howard & Merriam, Columbus.

St. Paul's Methodist congregation, of Trenton, N. J., will erect a new church building.

The contract for the new memorial building at Colgate University, Hamilton, N. Y., has been awarded to Edward K. Fenno, 204 North Beech Street, Syracuse. It will cost in the neighborhood of \$125,000.

The Scottish Rite Masons of Scranton, Pa., are discussing the erection of a \$200,000 temple.

C. H. Page & Bros., of Austin, Tex., have prepared plans

for a courthouse at Sweet Water, Tex., costing about \$100,000. Bids will be received until July 24.

The Bedford Stone & Construction Company has been awarded the contract for a \$200,000 hotel at Indianapolis, Ind.

The Y. M. C. A. of St. Louis is planning the erection of a \$200,000 building.

Ernest Salow is planning the erection of a \$250,000 hotel at Youngstown, O.

The Paterno Construction Company will erect a thirteen-story apartment house on West End Avenue and Seventy-fourth Street, New York. It will be of limestone, brick and terra cotta, and will cost \$250,000. The architects are Schwartz & Gross.

Bids will be received until July 24 for a \$125,000 high school for Minot, N. D.

The Municipal Art Commission of New York has failed to approve of the erection of a monument at 138th Street and Third Avenue, in this city, to the men from the Bronx who lost their lives in the Spanish American War. The memorial was approved by the Bronx Chamber of Commerce and other civic bodies.

During this month a memorial to General Francis A. Walker, soldier, statistician and educator, and until his death president of the Massachusetts Institute of Technology, will be begun. It is expected to be dedicated at commencement. It will be the social centre for the students.

Cornell University will erect a dining hall and kitchen building costing about \$350,000. The plans are by Day & Klauder, Philadelphia.

N. Serracino, architect, of 1170 Broadway, New York City, has been commissioned by the Augustinian Fathers, Rev. A. Baldassarre, Rector, to prepare plans and specifications for a new church to be built on the corner of South Ninth Street and Watkins Street, Philadelphia, Pa. The church will be in the Roman style, with a tower on the corner. The dimensions of the building will be 48 feet wide and 115 feet long, with a seating capacity of 900.

## Obituary Notes

Martin Bergen, connected with the Booth Bros. Granite Company for nearly fifty years, died at his home in New York the past month, in his seventy-first year.

Oney M. Canton, a member of Canton Bros., granite manufacturers, and president of the Barre Granite and Quarry Company, died at his home in Barre the past month. Mr. Canton was born in the Province of Quebec in 1870.

James S. Milne, one of the most prominent granite manufacturers of Barre, died suddenly the first of this month while boating on Lake Champlain. Mr. Milne fell into the lake from the boat, but an autopsy showed that death had ensued before the body reached the water. The deceased was born in Scotland in 1862, and came to this country 26 years ago. He had taken a leading part in the religious and fraternal life of Barre.

## Business Embarrassments

The United States Marble Company, 931 Cortlandt Avenue, Bronx, New York, has been adjudged bankrupt. The liabilities are \$7,509, and assets \$233.

The property of the Southern Marble & Granite Company, at Spartansburg, S. C., has been sold at auction for \$11,570. It was bid in by J. J. Burnett, representing the creditors of the bankrupt concern.

The J. Poulin Granite Company, of Montpelier, Vt., has filed a petition in bankruptcy, with liabilities of \$8,008.19, and assets of \$6,029.50.

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To every building contractor who has to meet the problem of surfacing or rubbing marble or composition floors, the CAVICCHI ELECTRIC FLOOR-SURFACING MACHINE will appeal as a thoroughly practical solution.

It is radically different in principle from any other floor surfer, being designed to overcome all defects of machines heretofore used. In actual service it has completely demonstrated its value, not only in dollars and cents results (based on quantity of production), but in the quality of work produced.

The No. 14 CAVICCHI FLOOR-SURFACING MACHINE is equipped with a 2-H.P. electric motor (direct or alternating current).

One man can easily operate it, whereas other 2-H.P. floor surfacing machines require two men.

It is very compact, comparatively light, and easily carried from floor to floor. The width over all is 16 in. and the total weight of the machine, including extra saddle-weight of 90 lbs. is about 400 lbs.

This machine is covered by strong patents; infringements will be prosecuted.

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ONE MAN operating a Cavicchi Floor-Surfacing Machine can do the work of ten men rubbing by hand. It will rub from 500 to 900 square feet of ordinary terrazzo in a day. On granolithic floors, which is the severest test to which a machine can be put, it has performed an average daily service of about 200 square feet.

It can finish flush to the wall, with the wheel guard removed, and one inch from the wall with it on. The compactness of the machine will permit its operation in very small rooms, such as in a lavatory, around the bowl, where the operation of a larger machine would be impossible.

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We guarantee the Cavicchi Electric Floor-Surfacing Machines for one year (from date of purchase), against defective materials and workmanship.

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One 2-H.P. G. E. Electric Motor  
One Snap Switch  
One 14 in. Surfacing Wheel, coarse for roughing  
One 14 in. Surfacing Wheel, fine for finishing  
One 90-lb. Iron Saddle-Weight  
50 ft. No. 14 Flexible Wire Cable

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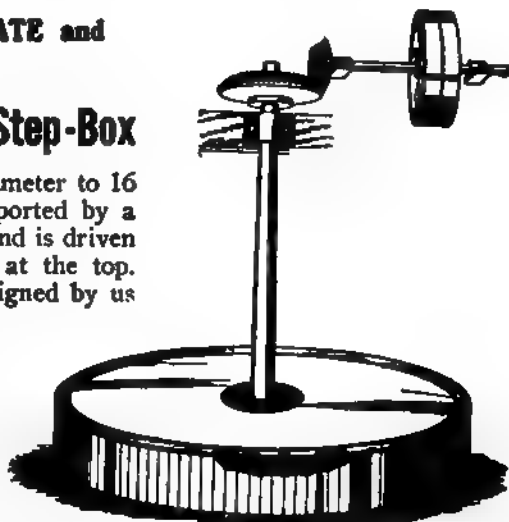
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He never had a rubbing bed, and did not like the idea of such a clumsy awkward affair, he thought joints should be a simpler operation. He never saw a lumber mill use a sand paper disc to "edge" a board and could not see why marble should not be worked on the same principle as wood. He had an idea that joints should be cut with a thin Carborundum wheel. There were several machines offered as "coping machines" to do the work. There was only one "JOINTING MACHINE" in the lot, only one machine in which the wheel cut through into a groove and made a clean, perfect joint every time. All the others left a fin on the bottom edge, they were COPING machines only (had to rub the joints afterwards).

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VERYONE who has the best interest of natural stone at heart advocates the use of lime mortar instead of portland cement for masonry purposes. Lime mortar will not stain the most delicate stone, whereas the stone may have unsightly discolorations if portland cement is used, unless all the surfaces of the stone in contact with the cement are coated with a waterproof paint. The introduction within recent years of hydrated lime, and the recognition of its merits by architects and engineers, cannot but have a stimulating effect on a more general adoption of lime mortar in all stone work. According to the manufacturers, hydrated lime can be defined as the dry flocculent powder resulting from the treatment of quick lime with sufficient water to satisfy the calcium oxide. This material comes into the market in bags or other convenient packages and is ready for use, requiring only gauging with water and mixing with sand in much the same manner as cement is used.

Several months ago we published an article discussing the reasons why ancient mortars were so strong. This was the outcome of investigations carried on by an English writer, and the reader drew the conclusion that the masons in the old Roman times bestowed far more care and attention on the preparation of mortar than would be dreamed of in these days. Bearing directly on this subject is a recently issued booklet, "Hydrated Lime," written by E. W. Lazell, Ph. D. This is a technical treatise on the chemistry, nature, preparation and use of hydrated lime, intended as a manual for architects and engineers, but it is written in very sprightly and interesting style. The following passage from Mr. Lazell's book ably supplements our previous article:

The danger of "burning" in slaking is much greater with high calcium limes since these generate the greater amount of heat, and it is therefore necessary to employ a large excess of water and to see that all the lime comes in contact with water. This excess of water lowers the temperature both by absorbing the heat and by evaporation.

Slaking is a chemical process and time is required to complete the action; hence, it is necessary to allow

the paste to age for some time to be assured of complete slaking. All lime contains some over-burned particles, or particles of lime which have united chemically with the silica or clay in the limestone, and these particles are extremely slow slaking, often requiring days and weeks to become thoroughly satisfied with water. Our forefathers recognized this fact and always allowed the lime paste to age for weeks, and often months, before using.

The necessity of aging lime paste before using was recognized by the Romans. Vitruvius gives the following directions for the preparation of lime plaster to be used in plastering. "This will be all right if the best lime, taken in lumps, is slaked a good while before it is to be used, so that, if any lump has not been burned long enough in the kiln, it will be forced to throw off its heat during the course of slaking in the water, and will thus be thoroughly burned to the same consistency. When it is taken not thoroughly slaked but fresh, it has little crude bits concealed in it, and so, when applied, it blisters. When such bits complete their slaking after they are on the building, they break up and spoil the smooth polish of the stucco.

"But when the proper attention has been paid to the slaking, and greater pains have thus been employed in the preparation for the work, take a hoe, and apply it to the slaked lime in the mortar bed just as you hew wood. If it sticks to the hoe in bits, the lime is not yet tempered; and when the iron is drawn out dry and clean, it will show that the lime is weak and thirsty; but when the lime is rich and properly slaked, it will stick to the tool like glue, proving that it is completely tempered."

The art of preparing lime mortar of the finest quality has survived in Italy to this day. "So late as 1851 an English architect, when sketching in the Campo Santo at Pisa, found a plasterer busy in lovingly repairing portions of its old plaster work, which time and neglect had treated badly, and to whom he applied himself to learn the nature of the lime he used, says Hodgson in "Concrete, Cement, Mortar, Plaster and Stucco." So soft and free from caustic qualities was it that the painter could work on it in true fresco paint-

ing a few days or hours after it was repaired, and the modeler used it like clay. But until the very day the architect was leaving no definite information could he extract. At last, at a farewell dinner, when a bottle of wine had softened the way to the old man's heart, the plasterer exclaimed, 'And now, signor, I will show you my secret!' And immediately rising from the table, the two went off into the back streets of the town, when, taking a key from his pocket, the old man unlocked a door, and the two descended into a large vaulted basement, the remnant of an old palace. There amongst the planks and barrows, the architect dimly saw a row of large vats or barrels. Going to one of them, the old man tapped it with his key; it gave a hollow sound until the key nearly reached the bottom. 'There, signor! There is my grandfather! He is nearly done for.' Proceeding to the next, he repeated the action, saying, 'There, signor, there is my father! There is half of him left.' The next barrel was nearly full. 'That's me!' exclaimed he; and at the last barrel he chuckled at finding it more than half full; 'That's for the little ones, signor!' Astonished at this barely understood explanation, the architect learned that it was the custom of the old plasterers, whose trade descended from father to son from many successive generations, to carefully preserve any fine white lime produced by burning fragments of pure statuary, and to each fill a barrel for his successors. This they turned over from time to time, and let it airslake in the moist air of the vault, and so provide pure old lime for the future by which to preserve and repair the old works they venerated. After inquiries showed that this was a common practice in many an old town and thus the value of old air-slaked lime, such as had been written about eighteen hundred years before, was preserved as a secret of the trade in Italy, whilst the rest of Europe was advocating the exclusive use of newly burnt and hot slaked lime."

If a good, sound, smooth working lime paste is to be made from lump lime, it is absolutely necessary that the lime be slaked some considerable time before using. Compare the method of slaking recommended by Vitruvius and that of the skilled Italian plasterer with the modern method of slaking the lime in the middle of a ring of sand and almost immediately hoeing in the sand. In the present practice more often than not, the plaster is placed on the wall or the mortar laid between the bricks within a few hours. Such mortar must contain free lime that has not had time or opportunity to slake. This lime later takes up water causing the mortar to be crumbly or the plaster to crack and pop.

In spite of improvements in the method of producing lime with better and more economical kilns, the material is brought into the market in the same manner as it was centuries ago. Further, the method of slaking lime has changed only for the worse, in that

our rapid modern practice does not admit of the slow action of slaking lime thoroughly on the operation.

Mr. Lazell claims that by the use of hydrated lime instead of the ordinary lump lime these disadvantages are eliminated and a mortar can readily be prepared similar to that used in the best days of building in old Rome.

### **Statuary for the Washington Arch, New York**

The Washington Arch, in Washington Square, New York, was erected some years ago in white marble, according to designs by McKim, Mead & White, to commemorate the centennial of the inauguration of George Washington as first president of the United States. The arch was turned over to Mayor Strong, structurally complete, on April 30, 1895. The original design contemplated groups of statuary at the base on either side of the arch, but no effort was made to supply these until recently. There has just been installed at the northeast base a beautiful marble group, showing Washington as a general of the Continental Army, backed by a group of allegorical figures. It is the work of Hermon A. MacNeil, New York, sculptor, and is one of the finest examples of memorial statuary in the country. The carving was done by Piccirilli Bros., No. 467 East 142nd street, New York. It is cut from a white marble block from the quarries of the South Dover Marble Company, in Dutchess County, New York. This accompanying illustration shows how effective this is in design, arrangement of the figures, and delicacy and beauty of carving.

### **May Reopen the Big Limestone Quarries at Martinsburg**

Attorney Wade C. Kilmer, who was appointed by the Federal Court at Martinsburg, W. Va., as a special master to take testimony as to the value of the property of the National Limestone Company, in the suit brought against it by the Northern Central Trust Company, has filed his voluminous report with the court.

According to statements made recently by officials of the National Limestone Company, it is altogether probable that the suits now pending in the Federal Court will be compromised and dismissed during the next term of the Federal Court in September. It is stated that the majority and minority stockholders, who have been at odds for about two years, have now about settled their differences and that a comprehensive plan of settlement and reorganization has been agreed upon. This statement comes from the highest authority, and there is every reason to believe that this will be done.

The plan contemplates the reopening of the big and costly plant near Martinsburg, within a few months, and this would give employment to at least 200, and probably 300 workmen.

## Hardness, Weight and Color of Marble



**H**ARDNESS may be defined as the resistance that the surface of substances offer to abrasion. The hardness of calcite is given as 3 in Moh's scale, and that of dolomite as 3.5 to 4, whereas that of glass is about 5. The hardness of a marble as a whole may be different from that of the individual grains that compose it, writes Oliver Bowles in "*The Technology of Marble Quarrying*," just published by the Bureau of Mines, Washington. The hardness is influenced by the degree of cohesion between the grains. Most fine-grained, compact marbles are harder than coarse-grained, varieties. Some marbles are remarkably hard even if no silica or other excessively hard impurities are present. Hardness of the mass as a whole is an indication of "workability," and is an important property, as the cost of quarrying marbles that are worked slowly by tools is much higher than the cost of quarrying those easily worked. Although the cost of quarrying hard marble may be high, the hardness is a valuable property if the material is to be exposed to abrasion.

High resistance to abrasion is desirable in marbles that are to be used for sills, steps, or floor tile, all of which are exposed to the friction of the feet of pedestrians. Marble employed for such uses should be hard, and uniformity in hardness is desirable; otherwise the surface will soon become uneven. In constructing floor patterns of different marbles, it is important that the several varieties should be equally resistant to abrasion, as otherwise the floor will eventually become uneven. This condition may be observed in the floor of the Union Station at Washington, D. C., where the white tiles of Vermont marble, after eight years' use, are in places worn down nearly half an inch lower than the small squares of harder material from Swanton, Vt.

A second agent of abrasion is wind. Wind polish of a pronounced character has been observed on rocks much harder than marble.

The Sioux quartzite of southwestern Minnesota, a rock that is probably harder than any other in the United States used for building purposes, has been so wind worn that corners have been rounded and the exposed surfaces have been given a glassy polish. Dust and sand carried by the wind on city streets tend slowly to wear away surfaces, mainly by removing insecure grains and thus exposing fresh surfaces to the agencies of weathering. The effects are most pronounced on corners and in nar-

### STATUARY FOR THE WASHINGTON ARCH, NEW YORK

Washington as a General in the Continental Army. Hermon A. MacNeil, sculptor. Carved by Piccirilli Bros., from a block of marble from the quarries of the South Dover Marble Company, in Dutchess County, New York

row spaces between buildings where the force of the wind is concentrated. Egleston states that in New York City many tombstones that face the prevailing winds are so worn that inscriptions are almost illegible.

The specific gravity of a substance is its weight compared with the weight of an equal volume of water. The specific gravity of calcite is 2.7 and that of dolomite about 2.9. Consequently, dolomite marbles are heavier than calcite marbles. It is found that the actual weight per cubic foot of a block of marble differs more or less from its theoretical weight calculated from the specific gravity of the constituent minerals. A porous rock of given volume will be lighter than an equal volume of similar material that is nonporous. In most marbles the pore space is small, and the actual weight does not differ greatly from that calculated from the specific gravity.

Marbles range in actual weight from 165 to 180 pounds per cubic foot. The economic significance of weight is chiefly in connection with the necessary strength of equipment for handling and freight charges for transportation. By knowing the average weight per cubic foot the quarryman may measure a block and calculate its weight with reasonable accuracy. He is thus enabled to judge the risk involved in handling it with any given equipment. Marble is a heavy structural material, and the necessary transportation charges must be carefully considered when bidding on contracts at a distance from the point of production.

Calcium and magnesium carbonates are practically insoluble in pure water. Certain dissolved gases, notably carbonic acid gas, which are present in surface water in small proportions, render the water capable of dissolving the carbonates to a limited degree. Marbles exposed to the weather are therefore slowly dissolved. Although the process is slow, its effects may be considerable when long periods of time are involved. That marbles are more soluble than rocks consisting of silicate minerals is demonstrated in nature. Most marble deposits in humid regions are found in valleys formed by the more rapid erosion of the marble belts than of the bordering siliceous rocks.

The rate of solution is variable in different marbles. It depends on the chemical composition, texture, and porosity of the marble, the climate of the region, and the nature of the atmosphere. Near large cities various acids from smoke abound in the air and are taken up by rain water, thus increasing its power of solution. If a rock is permeable it dissolves more rapidly than if impervious. Calcite dissolves more rapidly than dolomite under the same given conditions if the texture of each is similar, but the tendency for dolomite to occur with granular texture usually reverses the order of their solubility. The solubility of marble deserves careful consideration if its use for exterior purposes is contemplated, according to the author.

The color of a marble is one of its most important physical properties. It is governed by the nature of the constituents. Marbles consisting of pure calcite or dolomite are white because these minerals are white. A serpentine marble is green because the prevailing mineral, serpentine, is green. Variations from the white color of a pure marble are due to admixtures of foreign substances. Such impurities may be uniformly distributed and thus give a uniform coloration, or they may be present in bands or streaks, giving clouded or otherwise nonuniform colors. Examples of nonuniform color distribution are the "Pocahontas" marble of Alabama, the variegated marbles of Vermont, and the "crow foot" structure, irregular dark lines, characteristic of the Tennessee deposits.

The causes of some colors in marbles are easily determined. The black and grayish shades are to be attributed to carbon, which is usually present as fine scales of graphite though amorphous in the "crow foot" of Tennessee marble. Red, pink, or reddish-brown shades are due to the presence of manganese oxides or to hematite. Yellow-brown, yellow, or cream colors are caused by minute grains of the hydrous oxide of iron, limonite. Dale attributes the green color of certain Vermont marbles to the presence of sericite (fibrous potash mica), and the purplish tint of one of the dolomites of the Lake Champlain region to a mixture of hematite and magnetite. Referring to some of the less common colors, Dale comments as follows:

The more uncommon colors of marble are purplish, as in the Pavonazzo and Seravezza breccias imported from Italy, bright yellow, as in the "Giallo Antico" from North Africa, and orange yellow, as in some marbles from Norway. Among the uncommon combinations of colors is that of rose-pink and deep green in the "Leifset Gloire" from Norway.

The same author states that the dolomite of Hancock and Mount Tabor, Vt., owes its buff color to the presence of siderite. Vogt attributes the sky-blue, red, and orange tints of some Norwegian marbles to organic compounds. The "golden vein" of the Colorado-Yule marble is thought to be caused by the permeation of solutions bearing manganese or iron oxides. The green bands in certain parts of the same quarry are, according to Merrill, caused by the presence of chrome-mica. Parks describes green marbles in Ontario in which the color is due to needles of light-green actinolite. The pink color of one marble he attributes to "scattered flakes of brownish glistening mica." He states that brown colors are in many instances due to the presence of mica. He refers also to a marble having gray dots due in part to some crystals being clear and others milky, and in part to the presence of fine graphite. The clear crystals are dolomite, and the milky crystals calcite. Solution emphasizes the dotted effect.

For certain purposes, it is desirable to have a dis-

## SCULPTURE IN PEDIMENT OF EAST ENTRANCE, HOUSE WING OF NATIONAL CAPITOL

"Armed Peace Protecting Genius," an allegorical group by Paul W. Bartlett, sculptor. Carved by Piccirilli Bros., New York. Cut in Georgia White Marble, from the quarries of the Georgia Marble Company, at Tate, Ga.

tinged contrast between chiseled and polished surfaces. Such a contrast is especially desirable in headstones on which inscriptions are cut. The contrast is usually more pronounced in the colored, and less marked in the white marbles. A chiseled surface is opaque and somewhat granular, and reflects rather than absorbs the light. Hence it tends to appear white or light colored even if the stone is dark. When a face is polished the reflecting surfaces are removed, permitting the light to enter the crystals and be absorbed, causing the polished surface to appear much darker than the chiseled surface.

### Sculpture for the National Capitol

"Armed Peace Protecting Genius," an allegorical group in marble, was unveiled on the pediment of the east entrance of the House side of the Capitol at Washington, on August 2, with formal ceremonies. The sculpture is the work of Paul W. Bartlett, and is executed in Georgia white marble from the quarries of the Georgia Marble Company at Tate, Ga. It is one of the most imposing groups of monumental statuary to be found anywhere in this country. Congress appropriated \$75,000 for the work in 1908.

The sculptor is one of the most promising of our younger men. The following description is given of his work: "An allegorical group of two figures, 'Peace Protecting Genius,' fills the center of the pediment. Peace, an armed Peace, stands erect, draped in a mantle which almost completely hides her breastplate and coat of mail; her left arm rests on her buckler, which is supported by the altar at her side, in the background the 'olive tree' of Peace. Her right arm is extended in a gesture of protection over the

youthful and winged figure of Genius, who nestles confidently at her feet, and holds in his right hand the torch of Immortality.

"The composition is completed by two other groups, symbolizing and typifying the two great fundamental living powers of Labor, the two great sources of wealth, Agriculture and Industry. The most modest of our farmers and laborers can find in these groups the symbol of his own self and of his endeavors, he may even find there his own resemblance; and he will see that his helpmate, his children, his cattle, and the harvest from his fields have been exalted and carved in marble forms. The printer, the ironworker, the founder, can do the same, and enjoy the same profound satisfaction. The toiling factory girl, weaver or spinner of textiles, will observe that she has not been forgotten, and those who are devoted to the sea can discover a group which will remind them of the joys of their vocation. A wave terminates the sculpture at either end of the pediment, and is meant to indicate that all this humanity, all its power and energy are comprised between the shores of the two oceans, the Atlantic and Pacific."

### Rock Erosion in the Deserts

Erosion proceeds with considerable rapidity in the desert region of the Southwest, notwithstanding the scarcity of continuously running water, for rock disintegration is accelerated by the great daily variations in temperature. The rocks are heated to 125° or higher on the hot summer days and cool off rapidly at night to 70° or less, a difference of 50° or more; and in spring or autumn, when the sun's heat is less, the night temperatures are relatively lower.

### The New Western Union Building

One of the finest granite structures ever erected in this country is the new Western Union building, at Broadway, Fulton and Dey streets, New York. This is built entirely of Bethel White Granite, furnished by the Woodbury Granite Company from its quarries at Bethel, Vt. The president of the Western Union

ite shows up whiter than the terra-cotta in near-by buildings, and of course it has more life and beauty. The main point is that it will endure. It will not crack, or scale, or craze or disintegrate, but will stand as the stone-cutters have left it as long as the owners of the building have need for it. There are several points that should be brought out in any description of this building. It is one of the finest examples of granite cutting that can be found in this city, or elsewhere. Despite the great size of the structure and the enormous amount of finished material required, there were no delays because of failure to receive the granite when needed. The building was erected in almost record time. Above all, in spite of the tremendous advance in the cost of granite due to the persistent demands of the labor unions, it is a fact that the Western Union building is a productive investment, the telegraph company having been able to save sufficient expenses through the discontinuance of numerous branch offices that they have brought within this building to pay the entire interest on the bonds and effect a substantial saving per annum.

### War's Effect on Sand Industry

An increase in the quantity of glass sand used in the United States in 1915 over that in 1914 may be explained in part by the activity in the glass industry due to increased exports, a direct effect of the war in Europe. The production of glass sand in 1915 was 1,884,044 short tons, valued at \$1,606,640. This is the largest quantity ever reported by the United States Geological Survey, Department of the Interior, which has just issued its annual statistical report on sand and gravel. Some weeks ago figures were given out for the production of glass sands in the principal producing States, but the above are final figures for the entire country.

Molding sand was produced in very much greater quantities in 1915 than in 1914, owing in part at least to the foreign demand for vast supplies of machinery and munitions requiring the casting of metal, which called for the use of molding sand in large amounts. The total production of molding sand throughout the United States as reported to the survey was 3,585,746 short tons, valued at \$2,123,203.

The report shows that the total quantity of sand and gravel produced in 1915 and reported to the Survey was 76,603,303 short tons, valued at \$23,121,617. It includes also a list of localities where glass sand was produced in 1915 and another list of localities where it occurs.

### Women as Granite Polishers

Much has been written about the work of women in the war-stricken countries of Europe who are taking up the tasks of the men in the fighting line. It

#### FULTON STREET ENTRANCE, WESTERN UNION BUILDING

The entire building is of Bethel White Granite, furnished by the Woodbury Granite Company, Hardwick, Vt. Architect, William Wells Bosworth. General Contractors, Marc Eidlitz & Son, New York.

Company, Mr. Theodore N. Vail, is a native of Vermont, and he naturally turned to that state when the desire was to erect a monumental building. The wisdom of his choice is manifest to every one who passes the great structure. Mr. William Wells Bosworth, the architect, has provided a very striking, classical design, and one that shows the beauty of the material to the best advantage. It is worthy of note that the gran-

was not expected, however, that they had entered so trying and arduous an industry as the stone trade. The Aberdeen correspondent of *The Stone Trades Journal* of London, says: "I had the pleasure recently of visiting the polishing department of the granite manufacturing works of Messrs. Stewart and Co., Fraser Road, where seven female granite polishers are employed. It was interesting to see how skilfully they operated the machines under their charge, and the success that attended their efforts. The girls, who are very careful in the discharge of their duties, will only require a little more experience to prove themselves very efficient workers, and they seem to be already quite at home in their new sphere of labor. This innovation probably would not have been tolerated some years ago, but time and necessity work wonders in the way of breaking down prejudice. The firm has provided a special dressing room for the girls, with a plentiful supply of hot water, where cooking can also be done."

which are at Shell Bluff, in Burke County. They are evidently derived from marine shells and fossiliferous remains of marine animal life, as is clearly denoted by the many specimens taken from the bed. These limestone deposits can be used for fertilizing purposes but have never been developed to any extent.

### Georgia's Varied Stone Resources

An Atlanta newspaper, in commenting upon the varied mineral resources of Georgia, says:

Running transversely across the state, in the northern and middle portion, there is an immense underlying stratum of granite, used for building and paving purposes. It manifests itself in grandest and most stately form in Stone Mountain, which is said to be the greatest single boulder on earth, as well as one of the greatest wonders. Outcroppings of the same formation are found in various localities, such as Hancock, Oglethorpe, Elbert and Columbia, and some of the quarries produce stone capable of receiving a polish equal to the finest Quincy granite. This stone is used in the finest buildings in the great cities of the country, and for paving their streets, and for other purposes.

The beds of marble in the mountainous section of the state are the most extensive known, and the quality of the material is the highest. Georgia marble is freely used in many of the most magnificent structures that have been erected in the United States for the past two decades. It is especially adapted to fine ornamental work and interior trimmings for buildings, mantels and monuments. It is said that colored marbles exist in this state in greater variety and richness in color and shade than in any other portion of the globe. The marble industry of Tate and Cherokee is something enormous.

Slate and cement both abound in the southwestern portion of the state. Roofing slate of fine grade is extensively mined near Rockmart, Ga., and cement is also an article of commerce in Polk county and a number of contiguous counties.

The limestone deposits of the Savannah Valley extend from Augusta to the sea coast. They exist in almost unlimited quantities, the most considerable of

WESTERN UNION BUILDING, NEW YORK  
Bethel White Granite from the quarries of the Woodbury Granite Company was used for the entire exterior of this building. About 300,000 cubic feet of granite was required for the work, and the contract price for the exterior was \$1,500,000. Architect, William Wells Bosworth. General Contractors, Marc Eidlitz & Son, New York



## Electric Power in Slate Quarries



HERE is a growing use of electricity for quarry operations in this country, but it is almost entirely in stone quarries and not in slate quarries. On the other hand in Great Britain by far the greatest progress is shown by the slate quarries, while the stone quarries still cling to antiquated methods and appliances. Before a recent meeting of the Liverpool Engineering Society, Mr. G. K. Paton, an electrical engineer, gave an interesting account of the use of electric power in the Welsh slate quarries. Among other things, Mr. Paton said:

It is only within the last ten years that electric power has been introduced to any extent in the slate quarries of North Wales. Under the terms of the North Wales Electric Power Act of 1904, the company is authorized to supply power in bulk to power consumers with an equivalent amount for lighting purposes. The transmission lines of the power company now extend to the principal quarrying districts in an area of nearly 400 square miles, supplying many slate and granite quarries.

In Blaenau Festiniog the workings are all underground, and, consequently, the slate blocks and most of the debris requires to be hauled to the surface, electric power being used in the larger quarries, such as Oakeley, Maenofferen, and Llechwedd. Power is required in operating inclines, slate saw sheds, air compressors for rock drills, ventilating, and also for pumping. In the Nantlle district the quarries are of the open-pit type. Hoisting in these quarries is done by aerial suspension cable-ways and inclined hoists. At Bethesda and Llanberis the quarries are worked on the face of the hill and in pits, and the inclines are operated by gravity.

Power is required for the slate saw sheds; in the Penrhyn quarries at Bethesda entirely new machinery has been laid down—saw tables, cable-ways, ropeway inclines, and air compressors—by which it is expected that operating and production costs will be greatly reduced. That the results are satisfactory can be deduced from the fact that the plant has been increased by three times the original horse-power installed in 1912. Modern methods of quarry working all tend to reduce wastage, approaching in some quarries to as much as 90 per cent. One is apt to forget that it costs money to remove debris, and even yet, in some cases, full advantage is not taken of modern machinery to reduce this wastage and thereby cost of production.

Application of electric power in slate quarries is limited to the following purposes at present in operating:—

(a) Slate saws, guillotines, planing and drilling machinery in sheds.

(b) Haulage and winding gears, including hoists, cable-ways, and inclines.

(c) Air compressors for rock drills.

(d) Pumps.

The necessity for slate saws in a quarry is to avoid wastage and obtain the maximum size of roofing slate possible from the slate blocks.

(1) The ragged end is sawn off and facilitates splitting into what are commonly called "slates."

(2) In large blocks, a fault, or what it is called in Welsh "crych," in the block is sufficient to prevent saleable slate being produced; but by cutting the crych out, leaving two smaller blocks, good saleable slate is obtained.

(3) The blocks are cut to a suitable size for splitting by hand, an operation for which no machinery has yet been designed. Generally the provision of slate-sawing machinery prevents wastage of considerable quantities of rock; enables the production of saleable slate from blocks which would otherwise be thrown away, and of larger size slates, which are more valuable and marketable; reduces debris, and gives a higher production at a reduced cost.

Slate sheds should be erected as near as possible to that part of the quarry from which the blocks are obtained. Advantage should be taken of the electrical supply to install units of 15 b.h.p. to 20 b.h.p., driving 12 to 15 saw tables instead of the older method of concentrating all the saw tables in one large shed. When conversion is made to electric drive in these large sheds it is better to subdivide into groups of 12 to 15 tables, each group being driven by separate motor.

A convenient arrangement, recently laid down in Penrhyn quarry, is a shed 162 ft. by 58 ft., containing 12 saw tables, each driven by belt from a main shaft, 4 in. diam. at the center and tapering to 3 in. at the extreme ends, driven from the center by means of a squirrel cage, 3-phase induction motor of 20 b.h.p., coupled to a worm gear with a speed ratio of 960-45 revs. per minute, the secondary shaft being direct coupled to the main shaft. The slate tables are arranged six on each side of the motor equipment. The tables, which measure 8 ft. by 4 ft., are carried on rollers, and a continuous feed motion is given by means of worm, wormwheel, pinion, and rack gearing. The ratio of the gear can be arranged for any speed, according to the hardness of the slate rock to be sawn, varying from 1½ in. to 6 in. per minute.

The arrangement made for loading and unloading is interesting as a departure from the usual practice, and gives excellent results. Each table is served by a siding at each end from two main wagon lines outside the shed. This allows each table to be loaded at once and the debris cleared, giving greater freedom to the

crews working in the sheds, and preventing delay owing to the lines being blocked.

Slate-dressing machines are used to dress the slates to size, a gauge on the machine providing the necessary guide to obtain the maximum size possible. Some dressing machines are operated by a foot pedal and spring, but the usual type consists of a cast-iron frame to which is fitted a fixed knife, a fence, and gauge, all of which can be adjusted to the required thickness the slate to be cut. The revolving cutters are driven from the main shaft by fast and loose pulleys or by pulley and clutch as desired. No slate-sawing shed is complete without a saw-sharpening machine for sharpening the circular saws, and a saw-punching and setting machine. In the arrangement of the shed referred to, these are accommodated in the center part of the shed. To facilitate the unloading of wagons, overhead runways with pulley blocks are fitted in most sheds. These are hand-operated, and not, as a rule, used sufficiently to warrant electrification. In some quarries, where very heavy blocks are dealt with in the sheds, lifting tackle is necessary, but in other quarries the blocks are reduced in size at the quarry before being sent to the sheds, and the men prefer to lift these smaller blocks by hand.

Steel circular saws about 2 ft. diam., running at a speed of 26 to 36 revs. per minute, are used for cutting

the blocks of slate, the feed varying from 1½ in. to 6 in. per minute. The saw runs in a water bath. Carborundum saws, although satisfactory for some special purposes, are not generally used. For very large slabs a circular disc with projecting cutters is used.

### Government Orders Georgia Granite

The Navy Department of the United States Government has awarded to the Stone Mountain Granite Corporation a contract for \$85,000 worth of granite to be used in the construction of the marine barracks at Norfolk, Va.

There seems to have been a prejudice against the Georgia product by the engineer in charge, says the *Atlanta Architect*, but it was shown by bureau standard tests that the Georgia granite is superior to the competing stone, as a matter of fact, that mica is more evenly distributed and the granite much stronger in resisting power.

### New Haven Postoffice and Courthouse

One of the most striking and beautiful of recent government buildings in the east is the new United States Postoffice and Courthouse at New Haven, Conn., which we are illustrating in this number. The architect is Mr. James Gamble Rogers, of New York, and he has furnished a very dignified classical design,

#### NEW HAVEN POSTOFFICE AND COURTHOUSE

Built entirely of Pink Tennessee Marble from the quarries of the Victoria Marble Company, Knoxville, Tenn. Architect: James Gamble Rogers, New York. General Contractors: Charles McCaul Company, Philadelphia. Cut Stone Contractors: B. A. & G. N. Williams, New York

admirably suited for its purpose and surroundings. The building has a frontage of 150 feet, a depth of 200 feet, and is 80 feet in height. The exterior is entirely of pink Tennessee marble. For the work the Victoria Marble Company, of Knoxville, Tenn., furnished no less than 213 carloads of Victoria Pink marble, while the remainder of the stock came from the quarries of John M. Ross, Knoxville. The general contractors for the building were the Charles McCaul Company of Philadelphia, while the cut stone contractors were Messrs. B. A. & G. N. Williams, of New York.

### An Open-Air Theatre Planned

The foundation is being constructed for the Greek theatre that will ornament "Greystone," the estate of Samuel Untermyer at Yonkers, N. Y.

It is learned that the theatre will be in the form

of a semi-ellipse. The platform, rising six inches above the promenade, will be on the edge of a pool, which will be 82 feet in width. The platform, like the seats, will be built of petros limestone. There will be four tiers of seats, the uppermost to be five feet above the promenade. The seats, to be covered with leather cushions when occupied, will have room for from 150 to 175 persons. The largest diameter of the ellipse will be 84 feet. The platform will be 12 feet by 26 feet.

The theatre will be at one end of a garden that will extend over 400 feet of ground. At the entrance will be two pylons, one at either end, these being piers about ten feet high, made of limestone and brick. Leading up to the entrance will be a large flight of stairs. It is declared that the design of the theatre was not copied after any similar structure in the country. It will be like an open-air stadium.

## Freight Rates on Stone and Marble



HERE are frequent controversies over the distinction between marble and limestone. These generally arise over the question of freight rates or custom duties. As the word "marble" is purely a trade term and not a scientific classification, it seems impossible ever to get a positively conclusive settlement. The Carthage Marble & White Lime Company, of Carthage, Mo., has had a dispute with the Missouri Pacific Railroad over the freight rates on two carloads of building stone shipped from its quarries to Pasadena, Cal. Mr. George S. Beimdiek, the manager of the company, has written a letter of protest to the commercial agent of the railroad that is both good-natured and convincing. As the matter is one that has great interest to all shippers of stone, we take the liberty of quoting freely from the letter.

Regarding what is marble and what is limestone, says Mr. Beimdiek, I wish to say that technically there is no such thing as marble. Marble is nothing but a trade name, and is not taken into account by geologists. In Chamberlain and Salisbury's *Geology*, Volume I, the authors give a definition of marble as follows: "Marble—typically a granular crystalline limestone or dolomite produced by metamorphic action; but the term is variously applied to calcareous and even other rocks that are colored ornamentally and susceptible of a polish."

In Nelson's *Encyclopaedia* we find the following: "Marble in strict usage, designates only those varieties of limestone which have become entirely crystalline by complex processes of metamorphism."

In *The Americana*, published by the Scientific American, we find the following: "Jasper, an impure quartz, less hard than flint or even than common quartz, but

which gives fire with steel. It is entirely opaque, or sometimes feebly translucent at the edges, and presents almost every variety of color. It is found in metamorphic rocks and often occurs in very large masses. It admits of an elegant polish, and is used for vases, seals, snuff boxes, etc. There are several varieties as red, brown, blackish, bluish, Egyptian. Ribbon or agate jasper is jasper in layers."

Same authority gives: "Marble (from the Greek meaning to sparkle), a compact rock which, in its pure form is composed entirely of carbonate of lime or limestone. Almost any limestone rock is commonly called marble, even certain varieties of granite, onyx, porphyry, and rock composed largely of gneiss and mica-schist."

The same authority says: "Limestone, a common and widely distributed rock, consisting essentially of carbonate of lime and varying greatly in composition, color and texture. Limestones are also classified according to the uses to which they are put, and thus we have cement rock or hydraulic limestone used for making cement, lithographic limestone, statuary marble, etc."

From the above, writes Mr. Beimdiek, you can readily see that our product is a "marble," and it is also a limestone. According to the definition given in Chamberlain and Salisbury's *Geology* and also Nelson's *Encyclopaedia*, it cannot be classed as a marble because it has not been subjected to the metamorphic action to which they refer. It will, however, take a very nice polish (and we are proud of it) and therefore it is a marble.

In the magazine *STONE*, Vol. XXXIII, there is an article copied from an English trade paper published in London, which says: "Marble is a convenient term

for, and a compromise between many things. Those who go down to publishers with books will extract with labor and un-understanding, portions of chemical and geological treatises showing that marble is a crystalline carbonate of calcium, and will gravely put  $\text{CaCO}_3$  after it. They will, too, tell that marble is a limestone that is capable of taking a polish. What does all this jargon mean? Our beautiful Cipolino is beautiful because of its "talcous stratification"; our Giallo Antico is such a marvelous suffusion of yellow and pink because of the salts of iron it contains. But ignore all of these facts otherwise the marble will not be beautiful or even instructive. Our Irish Green marble is no marble but ophicalcite — a serpentine, and our Canadian blue Alomite is a sodalite."

Commenting on this article, the editor of *STONE* said: "For a building stone, or even for one that is used in monumental work, nothing is better or more suitable than a plain, simple name, and the place of origin is a desirable feature. There could be no improvement over such names as 'Buff Bedford,' 'Connecticut Brownstone,' 'Bethel White,' 'Milford Pink,' 'Dark Barre,' and the like. But with a decorative stone the eternal fitness of things seems to demand a fanciful and attractive name that would be a positive detriment to a structural stone."

Mr. Beimdiek then quotes from the Missouri State Geological reports and from the reports issued by the United States Geological Survey, all of which refer to the Carthage product as a crystalline limestone, and never once call it a marble. He adds: It is our opinion, after going through a number of reference books, that the name "marble" was originated by some ancient but wise quarryman several

thousand years ago in order to get ahead of his competitors. He may have had a better product or not, we don't know, but he evidently had enough faith in his product to give it a name so as to distinguish it from others. He must have had good success for when his copyright on the name expired, others used it and have been using it ever since.

If you will look over the definitions given of marble you will see that all of them say that "marble" is "stone." We therefore contend that we have a perfect right to bill our product as "stone" and apply the stone rate even though some of the "opinions from

COLONNADE, MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Architect: William Wells Bosworth, New York. General Contractors: Stone & Webster Engineering Company, Boston. Cut Stone Contractors: Shea, Donnelly, Giberson Company, Lynn, Mass. Built of Indiana Limestone from the quarries of the Indiana Quarries Company, Bedford, Ind.

acknowledged experts" define it as marble. We will now consider what the railroad had in mind when their rate experts in the tariff shops published the rates and tried to define what the rates covered. Your commodity tariffs giving the rates from Carthage refer to "stone," and so do all other tariffs covering the commodity produced by us. Your tariff, and practically all of the others, reads: "Will apply on stone, cut, lettered, figured, planed, polished, dressed or finished (*except monumental stone*, lettered, figured or polished), C. L. minimum weight 40,000 pounds." Note particularly "*except monumental stone*, lettered, figured or polished."

The rate that we contend should apply on our shipments is published in Trans-Continental Freight Bureau Tariff, No. 1N, Item 916, and reads as follows: "Stone, rough, sawed, hammered, chiseled or cut to dimension, not polished or lettered, minimum weight 50,000 pounds. Note: Will not apply on marble, jasper, onyx and slate blocks or slabs, sawed, dressed, hammered, chiseled, traced or polished."

The rate that was quoted to the Carthage Marble & White Lime Company is found in the same tariff, Item 676, and reads as follows: Marble, granite, jasper, onyx, and slate blocks or slabs (including mantels, monuments and tombstones, lettered or unlettered), plumbers' marble and printers' imposing stones, not otherwise specified, sawed, dressed or hammered, boxed or not boxed, chiseled (not sculptured) traced or polished, boxed or (if chiseled or polished surfaces are completely protected) crated. Minimum 36,000 pounds.

When the rate man in the tariff shop made up these rates he had in mind two distinct classes of work; one was cut or dressed stone for exterior building work, and the other monuments and interior marble work. Marble and onyx for interior decorations and slate for the cheaper class of sanitary work. We have tried to think why "jasper" is included in this but cannot find where anyone has ever heard of jasper in connection either with monuments, interior or exterior building work. We have investigated what jasper is and have come to the conclusion that the California people figured that the New Jerusalem will be located in their part of the country and as the "Good Book" tells us that the streets are to be paved with jasper they want to be ready when the times comes so they want to file the rate with the Interstate Commerce Commission and thereby give others a chance to exert their influence to have it located somewhere else. It may be that considerable jasper is shipped but we would like to know about it and for what purpose it is used. (For the information of Mr. Beimdiek we may say that jasper is a trade name applied to a pink and reddish quartzite quarried in South Dakota, and also called Sioux Falls granite. Of course it is not a real jasper, any more than what

the trade calls onyx is a real onyx. The South Dakota stone polishes well and has been used to a limited extent for interior decorations, notably for the bases in the Cathedral of St. John the Divine, New York. But it is also used for the manufacture of paving blocks and crushed stone, which makes Mr. Beimdiek's point all the stronger. He should inquire whether the crushed jasper or the jasper paving blocks pay freight rates according to the higher schedule.—Editor, STONE.)

In the note or exception to Item 916 you will notice that no exception is made on granite. Now granite is also stone and if used for building work there is no question in our minds but that you would have to apply the rate published in Item 916. Granite is seldom used for ornamental interior work, but marble, onyx and slate frequently are. However, granite is used for monuments, and it is therefore perfectly clear to us that Item 916 applies to exterior building stone without reference to the kind of stone, and that Item 675 refers to stone for interior decoration and for monuments.

### Shafts to Mark Overland Trail

The first of the permanent white marble shafts to mark the Mullan trail have been set in place and dedicated at Missoula, Mont., with appropriate ceremonies by officers of the Montana Geographical Society. The shafts bear the figure, in bold relief, of Captain Mullan, who first traversed the trail.

The movement to place these shafts was started some time ago by a group of public spirited citizens, aided by the geographical society. As fast as circumstances will permit all the important historical places along the trail will be commemorated by the shafts.

### Sand-Lime Bricks in Germany

Sand-lime bricks are manufactured in 65 cities, scattered over the major portion of the German Empire, according to a report from Consul General Julius G. Lay, of Berlin. There are no less than six important factories manufacturing these bricks in Berlin alone. One of these factories has an annual production of approximately 100,000,000 bricks. The sand-lime brick companies have been hard pressed by the war. Most companies closed their doors in August and September, 1914, and have not opened them. Sales in Berlin during the war have been very small. Some orders have been placed by the usual governmental undertakings, but these have progressed so slowly that the manufacturers are discontented. In 1914, before the outbreak of the war, the price generally asked for "Berlin" sand-lime brick was about \$4.28 per thousand. During the war prices have increased about one-third, and now \$5.71 to \$5.95 per thousand is obtained.





## Well-Drill Holes in Quarrying



WO or three months ago an article on "Modern Quarrying" was published in these columns. This was descriptive of the different forms of quarries and their method of operation. It was a portion of a paper by S. R. Russell, read before the Du Pont Sales Convention. Mr. Russell also gave an account of the manner of quarrying an immense tonnage of rock by means of a single blast, with the explosive distributed in well-drill holes. As it is frequently necessary to produce many thousands of tons of broken rock at the least possible cost, we reproduce Mr. Russell's clear and practical directions below.

The well drill or cable drill method of working a quarry face is now in quite common use. The use of large drills is constantly increasing among quarrymen. In fact the growing tendency is for large machinery of all kinds such as mammoth crushers, steam shovels, etc. Volume is what is wanted nowadays.

The advantages of the big drill over the piston driven drill are numerous. By carrying the holes the full depth of the face the stone is loaded and treated on one working floor. It eliminates the cost of bench cleaning. Loading operations are less frequent, thus lessening the danger. Stone can be shot down in greater volume and in better shape, making it economical to use a steam shovel. No bench cleaning makes it safer for the men. It is cheaper and can be used in outlying and temporary operations where the cost of installing a power plant would be out of the question. It permits a greater spacing of bore holes and eliminates the necessity of "squibbing" or springing.

In this method usually holes from four inches to six inches in diameter are drilled the full depth of the face from 15 feet to 20 feet apart and as far back and the whole face shot down at one time.

The cost of well drilling may vary all the way from 20 cents to 75 cents per foot, and in extremely hard rocks up to \$1.50 per foot. In the flat laminated rock of the Middle West as much as 75 feet of hole can be drilled per day, while in the harder pitching rocks, common in the East from 25' to 40' per day is considered good. I know of a few places where five or six feet per day is all that can be made.

These drills are best adapted where the strata are flat and the height of the face exceeds 25 feet. When used in harder rocks it is best to drill a 5½" hole because it is possible to concentrate more explosives in the bottom where it is usually most needed and the larger hole permits greater spacing, hence minimum drilling cost.

In lighter materials such as shale or sandstones or even in some limestones with a shallow face it may be more economical sometimes to use a 4" or 4½" bit, because not so much concentration as distribution may

be desirable and a considerable saving of explosives can be made. A 5½" hole requires about 15 pounds of dynamite and a 4" hole only about 7½ pounds to fill one foot.

Spacing of holes depends on the character of the material and the depth of the face. A nice spacing for holes 35 feet deep is about 12 feet apart and 15 feet back. Holes 60 feet deep can be spaced 16' x 20' and holes 100' or more 20' apart and 25' back in most materials. I don't believe it advisable to ever space more than 20' apart.

Holes should be drilled three or four feet below the quarry floor, unless there is a natural parting at that level, in which case, if holes are sunk to grade the bottoms will come clean. Going below the floor insures better breakage, cleaner floor and permits easy access for a steam shovel if used.

No rules can be given as to the amount of dynamite to load in holes of given depth; all depends on local conditions. The important part is the selection of the proper explosive to produce the desired results. Explosives differ widely in their action and what would suit one condition may not fit another.

I usually before loading calculate the number of tons or cubic yards available in the blast and then aim to get about five tons of stone per pound of explosive, varying the load per hole according to the burden or local conditions.

In deep holes considerable saving can be made by breaking the load two or three times with equally good results. The object in breaking the load, besides saving explosives, is to distribute the charge where the rock is hardest, skipping seams and weak points where it is not needed. It is good policy to arrange the breaks so that they are not all on the same level. This amounts to the same thing as shooting two or more benches simultaneously.

In loading deep holes there is a little gained by removing the paper and loading the dynamite loose or in bulk. In fact the danger is increased by so doing as loose powder may be scattered all along the walls of the hole and at the mouth. When this occurs there is danger of a stone working loose, getting wedged between the tamping block and wall, causing friction and setting off the charge.

Before loading all the water possible should be removed from the holes. There is always some water in well-drill holes which cannot be removed. It is advisable to use large cartridges as they are much more convenient and lighten the labor considerably in loading.

If holes are loaded in cold weather care should be taken to see that the explosives are properly thawed.

As a usual thing well drill holes are driven and blasted in one line, holes being equidistant from the face.



Occasionally in very hard ground better results are obtained by staggering the holes. There is also another known as "buffer" shooting or shooting against the bank. By this is meant that a line of holes is shot down and then another line drilled and blasted before the debris from the previous shot is removed. This method is well adapted in limestone formations where the stone is flat and thinly laminated on top. It is only necessary to loosen or push out the bottom in such a formation. It eliminates the necessity of lifting and laying tracks or moving the shovel so frequently as when clear bank method is used.

In hard rocks a combination of 60% and 40% dynamite is recommended. A little 60% should be loaded in the bottom of each hole and 40% used on top. In softer flat limestone a 40% explosive will usually be found strong enough and often a lower grade can be used for top load. If the work is very wet and the toe heavy it may be necessary to use a gelatin dynamite from 40% to 60% strength.

It seems unnecessary to say that strong detonators should always be used, at least No. 6 Electric-Blasting Caps, and better still, No. 8. If holes are double or triple loaded at least two electric blasting caps should be used in each charge unit to assure thorough detonation and to afford a way out in case one should be broken or otherwise spoiled during tampering. I have found Electric Blasting Caps with duplex wire leads a great convenience in loading deep holes.

They are handier, stronger, and better than those with two single leads. Oftentimes short length electric blasting caps are used and connecting wires spliced to make necessary length. A good scheme followed in one big operation is to use wires with colored insulation, splicing a red wire to one leg and a blue to the other.

When final connections are made—parallel method—the red wires are connected to one lead and blue to the other. There is no chance of a mistake if this is done.

Sand, clay or fine screenings should be used for tamping and holes filled up to the collar. In holes up to 35 feet deep a tamping pole or stick can be used handily. If of greater depth it is necessary to use a rope and block as a tamper.

A tamping block should be of wood about four feet long and from 3" to 4" in diameter with a rope fastened at one end. For very deep holes a light tripod can be built and the block operated by two men with the rope over a pulley at the apex.

Each Electric Blasting Cap should be tested for circuit with a reliable galvanometer before being placed in the hole. When all the holes are loaded and connections made be sure by test that the resistance of the circuit does not exceed the capacity of the blasting machine or power circuit and fire the blast as soon as possible after loading is completed.

### The Granite of Cape Girardeau

A writer in one of the newspapers at St. Joseph, Mo., says: There is a splendid quality of granite and marble in southeast Missouri, although it is not quarried to any great extent. The Cape Girardeau normal school was builded with this stone, quarried within the city limits. The contractor who erected the structure informed me that the contract ruined him financially, because of the enormous expense necessary to quarry and dress the stone. The building, however, is a beauty, and a splendid advertisement of Missouri's building material. There are a large number of banks throughout the southeastern counties that have interior finishings of the same stone, which makes a very beautiful appearance when properly dressed and polished. In time there will be organized a company with sufficient capital to make the development of this industry profitable, but until that day our Missouri granite will be little known outside the locality in which it is produced, since it cannot be produced on a small scale with profit to the producer.

### Railroad Must Build Siding for Stone

The Pennsylvania Railway must construct a side track and shipping facilities for the Queen City Crushed Stone and Gravel Company at its plant in Clermont County, Ohio, as sought by the stone company, so the Ohio Utilities Commission has ruled on the complaint that has been investigated.

The stone company must stand the cost of installation of the siding and switches, but they must be of a nature that will permit the easy transportation of the shipment to be turned over to the road.

The Cincinnati Crushed Stone and Gravel Company was one of the parties to the contention, it having stations and works both east and west of the new company. Efforts to have the new company pay the old stone company half the cost of its track installation and depend on that for shipments was denied by the Utilities Commission.

### A Big Wisconsin Quarry

One of the largest crushed stone plants in Wisconsin is that of the Leathem & Smith Company, at Sevastopol, Door county. This has a capacity of 1,000 tons of crushed rock a day. Since the crushing machines have been added to the plant the waste of years is being utilized. There are fully 250,000 cubic yards of spalls in one large pile extending along the north end of the quarry which accumulated during the years. These spalls are loaded into cars by a steam shovel, each car containing four cubic yards or five tons of stone, and conveyed to the crushing plant by the "dinky" locomotive. The cars dump direct into the large crusher, which breaks up the entire five tons in four minutes. From the main crusher the product is car-

ried by pocket and belt conveyors to screens where the stone is washed and assorted into the various sizes and the stone which came through too large is returned to two smaller crushers where it is recrushed.

From the quarry proper is taken an immense amount of rubble and rip-rap stone, which is used entirely in breakwater works by the government. The quarry has a face 50 feet in height, and thousands of tons of rock are thrown down by a single blast, loaded into six-inch well-drill holes.

### The New Toronto Terminal

The city of Toronto is building a union railway station which will be the largest and most complete structure of its kind north of our Canadian border. This is for the Toronto Terminals Railway Company, comprising the Canadian Pacific and Grand Trunk Railway Companies. The architects are Messrs. Ross & Macdonald and Hugh G. Jones, of Montreal. After they had thoroughly studied the traffic problem in Toronto and gathered information from the operation of large railway stations in the United States, they designed the new building as a massive structure, with exterior in Roman classic architecture, with plain and simple wall surfaces, sparing of ornament. This at once secures a beautiful and dignified effect and at the same time avoids the dinginess and discoloration that often comes within a few years to an elaborately ornamented building wherever the atmosphere is smoke-laden. How successfully the problem has been met is shown by the accompanying illustration, from the architect's drawing.

The contract for the cut stone work, probably the largest cut stone contract every awarded in Canada, has recently been awarded to Geo. Oakley & Son, Limited, of Toronto, by the general contractors, P. Lyall & Son Construction Company of Montreal. There will be nearly 200,000 cu. ft. of cut stone, all of which will

be supplied by the Indiana Quarries Co., of Bedford, Ind., and cut in Toronto, with the exception of about 15,000 cubic feet of base, which will be Queenston Stone, from Queenston, Ont.

In considering the design of the station, it was found that the average normal traffic at Toronto could be taken care of by a station building of somewhat smaller dimensions than the one proposed, but it is in consideration of the heavy maximum periods, such as at the annual exhibition time, June and Christmas holidays, with their attendant crowding and discomfort, which have influenced the architects in recommending the construction of a building large enough to afford a complete separation of entrance and exit traffic during heavy periods and for a time when the traffic of the station has grown to demand it.

### A Big Contract for Interior Marble

The New Courthouse Building Commission of Cincinnati has awarded the contract for the interior stone and marble work in the new Courthouse in that city of the Vermont Marble Company, Proctor, Vt. The Vermont company, with a bid of \$341,750, was the lowest of five bidders who submitted estimates. In awarding the contract, the commission reserves the right to take advantage of an alternative providing for the deduction of \$4,500, if Tennessee marble is substituted for the French limestone provided in the specifications for the main entrance hall.

The Standard Marble Company, Cincinnati, submitted a large number of samples to the commission and asked members to award it the contract on a bid of \$367,000, which provided that white Italian marble be used in place of domestic marble. Assistant Prosecutor Hickenlooper ruled that the contract must be awarded to the lowest bidder, regardless of the material bid on.

The Vermont company will use a white domestic

#### THE NEW TERMINAL STATION AT TORONTO

One of the largest structures of its kind north of the Canadian border. Architects, Ross & Macdonald and Hugh G. Jones, Toronto. General Contractors, P. Lyall & Son, Montreal. Cut Stone Contractors, George Oakley & Son, Ltd., Toronto. Built of Indiana Limestone from the Indiana Quarries Company, Bedford, Ind.

marble from its own quarries in the main halls and corridors of the new Courthouse. The Vermont company agrees to complete the work in 275 days after it shall be notified that the building is ready for marble.

### Cut a Mile Deep in Solid Stone

Few persons can realize on a first view of the Grand Canyon that it is more than a mile deep and from 8 to 10 miles wide, says the United States Geological Survey. The cliffs descending to its depths form a succession of huge steps, each 300 to 500 feet high, with steep rocky slopes between. The cliffs are the edges of hard beds of limestone or sandstone; the intervening slopes mark the outcrops of softer beds. This series of beds is more than 3,600 feet thick, and the beds lie nearly horizontal. Far down in the canyon is a broad shelf caused by the hard sandstone at the base of this series, deeply trenched by a narrow inner canyon cut a thousand feet or more into the underlying "granite." The rocks vary in color from white and buff to red and pale green. They present a marvelous variety of picturesque forms, mostly on a titanic scale, fashioned mainly by erosion by running water, the agent which has excavated the canyon.

### Increased Sales of Lime

The lime sold in the United States in 1915, according to G. F. Loughlin, of the United States Geological Survey, amounted to 3,589,679 short tons, valued at \$14,336,756, an increase of 6.2 per cent in quantity and 8 per cent in value over the figures for 1914. The average price per ton, \$3.99, was 7 cents more than that of 1914. The value of lime sold for chemical works, sugar factories, fertilizer, steel works, and miscellaneous purposes increased and more than offset decreases in the value of lime sold for building, paper mills, and tanneries. The number of plants in operation decreased from 954 in 1914 to 905 in 1915, and the number of kilns in active operation from 2,406 to 2,331.

Sales of hydrated lime continued to increase in 1915, amounting to 581,114 tons, valued at \$2,457,602, an increase of 12.8 per cent in quantity and 9.7 per cent in value over the sales in 1914. The average price per ton in 1915, however, dropped 12 cents, to \$4.23.

### Duty on Pulverized Limestone

The Board of General Appraisers has upheld the claim of H. D. Spencer, of St. Albans, Vt., in regard to pulverized limestone imported from the Province of Quebec in Canada, and consigned to the Farmers' Union, of the State of Maine, to be used in fertilizing the soil. Duty was assessed as a mineral substance under paragraph 81 and it was held to be free of duty as "manure or substances used only for manure."

### Asbestos from the Ural Mountains

Asbestos is found in insignificant quantities in the Caucasus and in Siberia, but about 99 per cent of the Russian output is mined in the Ural Mountains, writes Consul General John H. Snodgrass from Moscow. Some of the best asbestos mined in the Urals is produced at mines 60 miles northwest of Ekaterinburg, in a zone of serpentine rocks, which extends about six miles and is about 1,400 yards broad. The quality of this asbestos is believed to be as high as that of Canada and Piedmont. The veins are directly broken off either by hand or by a hard hammer. The operation of mining asbestos in the Urals is of a primitive character, but in some cases the production is being made more systematic.

### Samples of Our Commercial Marbles

A collection of commercial marbles which, when completed, will embrace samples of all those produced in the United States and several important types from foreign countries, is being made by the United States Bureau of Standards. During the month of June, the bureau prepared specimens for expansion tests of 50 commercial marbles. Freezing tests were made on 14 of these. During the progress of this work, 61 samples of polished marble, 8 by 12 inches, have been received from various quarries in the Eastern and Southern States, and plans have been worked out for displaying these to permit persons interested to study and compare the different types.

### A Big Boulder as a Quarry

A huge boulder having ten acres of surface above the ground, from which granite is being taken for building the new Oklahoma state capitol, is said once to have been a favorite bandit rendezvous. It is a solid mass, towering above the treetops and formed of an excellent grade of stone.

### Fossil Remains in a Quarry

Thirty years ago the Peabody museum of Yale university recovered part of a skeleton of a dinosaur from a red sandstone quarry in South Manchester, Conn., but the quarry was then sold and most of the stone put into a \$100,000 bridge. Now the university authorities have permission to tear down this bridge to find the rest of the dinosaur's bones.

### A Stone Highway in Canada

A stone highway to cost \$600,000, is to be built from Ottawa, Canada, 60 miles south to the St. Lawrence river international boundary. It is stated that the road is to be built as a memorial to the late J. P. Whitney, premier of Ontario.

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THE Alaska bureau of the Seattle Chamber of Commerce is taking action looking toward the development of the resources of our northernmost territory. It has formally adopted a resolution urging that owners of buildings in process of construction in Seattle make use of Alaskan products as far as practicable. It points out that the development of the marbles, gypsum and other building products of Alaska will be of direct benefit to the business men of the northwest coast. Already a considerable industry has been built up in Alaskan marble, and the material is recognized as of excellent quality. This is the proper way to go about the stimulating of any local industry; get the business men of the district interested. As we have many times pointed out, the usual way is to insist that the Federal Government step in and give contracts without considering the question of cost at all.

THE city of Butte, Mont., is proposing to repave some of its business streets with patent paving or wood blocks. One of the Butte newspapers, in commenting upon the matter says: "All property owners are at least agreed that the granite blocks must go. The presence of the stone blocks marks Butte as being ten years behind the times." That is strange news to read here in the East. The tendency in all progressive cities, where the subject of street paving has been given scientific study, is to revert to granite blocks in preference to any other material. Of course great improvements have been made in granite paving in recent years. The blocks are smaller than formerly, are better cut and more carefully inspected. When they are given a good foundation and the joints are well grouted, it is found that the noise, which was once the chief objection, is largely eliminated. There has never

been any question that granite is the most durable and consequently the cheapest paving, and that it affords the best foothold for horses. It would behoove the taxpayers to think again before deciding to discard its granite blocks. The thing to do would be to recut them and relay them in accordance with modern practice.

ACCORDING to the war revenue bill passed by Congress a special tax of eight per cent. for each taxable year is placed on the gross receipts from the sale or disposition of "gunpowder or other explosives," excepting blasting powder and dynamite, when such sales exceed \$1,000,000, except that in no case will tax be assessed which would result in reducing the net profits below ten per cent. on the investment. The net profits of those engaged in the manufacture of gunpowder and other explosives are already taxed, the same as with other corporations, and thus the powder companies are subject to a double taxation, both on net profit and on gross receipts. The law is also retroactive, inasmuch as the first taxable year begins with January 1, 1916. Inasmuch as it is proposed to tax "munitions of war," it seems unjust to limit these to the three items of copper, guns and explosives, and also to apportion the burden so unequally that copper will bear a minimum tax of three per cent., guns, etc., of five per cent., and gunpowder or other explosives, eight per cent. It has been estimated that the holders of a single share of one powder company will be compelled to pay \$38 under this bill, while the holder of one share in another company will be mulcted to the amount of \$60. The stone industry is one of the largest users of powder and high explosives, and whatever will have a tendency to increase the price of these supplies is of vital interest to the trade.

EVEN the most enthusiastic advocates of concrete are constantly telling of the necessity of using the most extreme care in the selection of materials and the mixing of the concrete if disaster is to be avoided. There are so many sources of danger that one would think architects and building owners would fight shy of the stuff. It is strange that they will specify material that may bring them ruin or death from some carelessness of others that they cannot foresee or safeguard. The United States Bureau of Standards has just issued a bulletin on the "Compressive Strength of Portland Cement Mortars and Concretes." This is sent out with the following announcement: "Concrete differs from most structural materials in that it is not manufactured at a mill or plant according to chemical formula, under the observation of skilled specialists, subject to rigid inspection and test, and such control as to produce a uniformly homogeneous product; nor is the process of manufacture completed in a few hours or days as in the case of steel

products. Furthermore, concrete is made from materials obtained from sources differing widely in characteristics which affect its quality. The proportions of the ingredients, the amount of water used in mixing, the thoroughness of mixing, the manner of placing, the atmospheric temperature and humidity, exposure to sun, rain, and wind, immersion in fresh water, sea water, or other natural solutions, all affect the quality of the concrete." Surely this does not seem to afford much encouragement for the concrete user.

No EXCUSE is needed for the rather full presentation in another column of the arguments advanced by a southwestern stone company against the classification of its product by the railroads under the freight schedule. This was prepared, of course, with particular reference to the individual case involved, but the general principles are applicable to very many shipments of stone. There is no escaping the conclusion, so ably drawn by the manager of the stone company, that the different classifications under the freight tariff were originally intended to distinguish between stone for exterior building work and stone for monumental work and interior decoration, without regard to the variety of stone itself. There is absolutely no reason why structural marble should pay a higher freight rate than structural limestone or sandstone, just because it is marble. We have too high an opinion of the Interstate Commerce Commission to believe that they would permit such an unjust discrimination to be made. It is only human nature for zealous officials to seek to exact the highest possible rates, and it is extremely difficult to draw up any classification that may not work a rank injustice unless it is interpreted in an intelligent and liberal manner, "according to the spirit rather than the letter of law." It will not have escaped the memory of our readers that our sapient custom officers have frequently refused admission to the country of the master creations of geniuses like Donatello or Della Robbia as "works of art," but have endeavored to hold them subject to duty as "manufactures of marble" or of porcelain. Perhaps it is too much to expect that freight agents shall be geologists or custom officers art critics, but they might at least show common sense and a rudimentary idea of logic.

### **The Embargo on Scandinavian Granite**

The granite working industry of Great Britain, which centers largely in Aberdeen, is very much wrought up over the strict embargo placed by the British government on the importation of Scandinavian granite. The reason for this action on the part of the government is, of course, the scarcity of ships and the necessity for using all available bottoms for the carrying from the northern countries of wood pulp and pit props. The latter are imperatively

needed if the coal mines are to be worked to their full capacity. There has been a wide and general discussion of the entire subject in the stone trade and architectural press, public meetings have been held, the Board of Trade has been memorialized, and urgent efforts have been made to induce the government to modify its restrictions.

Those who seek to make the best of the situation declare that the competition of the foreign quarries has long been very severe, and that opportunity will now be afforded for the granite quarries of Great Britain to reestablish themselves and build up their business anew. The answer to this is, first, that the British quarries are greatly handicapped for want of men. They cannot supply enough suitable stone to keep the cutting shops busy. In the second place, the demand in these days, especially for monumental work, is for granite of color and quality that can be had from Norway, Sweden and Finland, but is not to be found in the British Isles. About three-fourths of the rough stone worked in Aberdeen comes from the three countries named above, while the finished product is shipped to England, the United States, Canada, Argentina, South Africa, Australia, New Zealand and France. The extent of the trade is shown by the fact that in the year prior to the commencement of the war, the foreign granite imported into Aberdeen amounted to 22,496 tons, and the total value of granite monuments and fronts exported from Aberdeen to other countries amounted to about \$521,000, nearly all of which was made of imported granite. It is stated that an American retailer recently visited Aberdeen with some 300 orders in his pocket, booked at 20 per cent. advance on pre-war rates. He found it impossible to do business there, so he went to Norway, and announced his intention in the future to deal directly with the manufacturers in that country.

In commenting on the futility of expecting that the British quarries can undertake to supply the demand, the *Stone Trades Journal* faces the situation squarely. It says: "In some quarters it is asserted that the embargo on foreign granite will stimulate the local quarries and that the deficiency can thus be made good by the substitution of the home for the foreign article. But this seems more than doubtful, for the following reasons. First and foremost, the staffs of the local quarries have been greatly depleted, and unskilled men, even if obtainable, are not of much use. Quarrying has locally been on the downgrade for many years. To make a quarry a successful venture a market must be found for each of the elements in the composite product obtained. Orders for the classes of materials required for road and sett-making, general building, dock and bridge work, besides those for monumental stones or "blockers" must be forthcoming. It is calculated that for every 1,000 tons of rock raised suitable for monumental work, some 12,000 tons are raised

suitable only for rougher work. Just as the Aberdeen granite industry began and developed by first supplying the rougher materials used in paving, dock and bridge work, so was it first undermined by foreign quarries supplying the same class of work. When the demand for these decreased a larger proportion of working expenses had to be borne by the product in demand, and hence the price of monumental stone increased. Further to supply promptly the demand for stones of various sizes it was necessary to keep a large stock, and this further added to the difficulty. Hence the stone from the foreign quarries, in which, by the way, British capitalists are largely interested, proved to be cheaper, and hence its common use by the local manufacturers. The result was that a large number of the local quarries were shut down and the country is dotted over with these relics of a formerly prosperous trade. Only the strongest quarries survived, and to expect their further development at a time when money is so dear and the markets for the allied products practically dead, is too impractical to be at all likely. Add to this the temporary nature of the demand and the fact that in any case the local stones have neither the variety of color nor the ease in working possessed by much of the foreign material and the extreme improbability of the local quarries ever filling the gap is evident."

### Notes from the Stone Fields

#### MARBLE AND GRANITE

A Barre granite monument has been erected in Woodland Cemetery, Dayton, O., in memory of Edwin J. Brown, for many years superintendent of the Dayton public schools.

The Northwest Granite Company, of Baker City, Ore., recently shipped two carloads of finished granite, the largest single shipment it has ever made.

The Criterion Theatre, at Atlanta, Ga., has just been completed, after plans by A. Ten Eyck Brown, of that city. The exterior is of granite and terra-cotta, and the interior is finished in Italian Pavonazzo marble.

Capitalists from Union and Pacolet, S. C., who recently purchased the property of the bankrupt Southern Marble & Granite Company, at Spartanburg, S. C., have formed a new company, and the plant will soon resume operations under new management.

The Picton Island Granite Company is installing an electric conveyor to carry stone from its quarries at Alexandria Bay, N. Y., to barges in the St. Lawrence River.

Workmen are now engaged in cleaning the magnificent new postoffice at Denver, built of Colorado marble and completed only a year ago. It is said that the air of Denver is so impregnated with smoke that the stone becomes begrimed almost as soon as the cleaning is completed.

An imposing marble monument will be erected this year on Gold Creek, near its confluence with Hell Gate River, Mont. The shaft will mark the spot where gold was first discovered in the state.

Mr. Barry, proprietor of the monumental works at Necedah, Wis., has just installed a modern pneumatic equipment.

The Chamber of Commerce of Spokane, Wash., expects to erect a marble fountain in that city in memory of Herbert Bolster, "the father of the Interstate fair."

The Widell Company, which has a paving job at Mankato,

Minn., has been held up by inability to obtain granite from New Ulm, owing to labor troubles. The company has now succeeded in getting suitable stone from Dresser Junction, Wis.

The city of Boston is advertising granite paving work to be done with an appropriation of \$400,000 made for that purpose.

The St. Nicholas Baths, at St. Nicholas Avenue and 111th and 112th streets, New York, the largest in the city, have just been opened. They cost \$500,000, and the interior finish is of white Vermont marble.

James Doherty, Jr., has been awarded the contract for granite paving on Colerain Avenue, Cincinnati, at \$79,028.

The Haglin-Stahr Company, of Minneapolis, Minn., has entered a suit in Washington County Court, Vermont, against the Montpelier & Wells River Railroad, asking damages of \$1,070. The plaintiff avers that a granite column valued at \$225 and a granite block worth \$830 were shipped to Minneapolis by a Barre granite concern and that both stones were broken in the course of transportation, rendering them worthless.

W. J. Simon has bought the Eggebrecht interests in the firm of Eggebrecht & Miller, marble dealers, of Lake Geneva, Wis., and the name has been changed to Miller & Simon.

#### LIMESTONE AND SANDSTONE

The Virginia officials have reached no decision as yet as to the location of the state limestone grinding plant to be established in Tidewater, Va.

Owing to a strike of the structural steel men, all work on the new courthouse at Cincinnati has been suspended. Ingalls & Co., of Bedford, have the contract for the stonework.

A limestone quarry is to be opened at Greybull, near Cheyenne, Wyo. From forty to fifty men will be employed, and the work will be in charge of W. G. Glenn, of Denver. A switch from the Burlington tracks is being constructed to the quarry. The output will largely be used in the beet sugar factories.

During the past month the cornerstone was laid for a new church for the Holy Cross Catholic congregation at Bellevue, near Scranton, Pa. The structure will be of Indiana limestone.

The new lodge-house of the Elks at Newcastle, one of the finest fraternal buildings in Western Pennsylvania, has just been opened. It cost \$125,000.

The National Motor and Supply Company, of Pittsburgh, has purchased the extensive quarries west of Springfield, O., from the Strunk-Meyer Company, of Cincinnati. The company also obtained the balance of a ten-year lease held by the Gold Springs Lime Company. About \$75,000 will be expended on new equipment.

The new \$25,000 passenger station of the Missouri Pacific Railway at Joplin, Mo., will be built of Carthage stone, officials of the railway declare.

The Remy quarry, near Keosauqua, Iowa, will be reopened and operated by a company that is expected to employ three hundred men. A stone was recently taken out of this quarry that measured 12 by 3½ feet by 18 inches.

#### SLATE

An American consular officer in India has been requested by a commission agent to furnish him with the names and addresses of American manufacturers of school slates and slate pencils.

The Bangor Slate Mining Company, of Bangor, Pa., has just issued an interesting little booklet concerning the merits of slate roofing as compared with other roofing material. It also gives instructions and illustrations showing how to lay a slate roof, the number of pieces to the square, nails required, strength of construction. The company will cheerfully send a copy of this booklet free to any prospective builder.





will be found that the points in curved lines folded back coincide with points shown on straight oblique cuts at cylindrical elevation.

These are proofs that occur to the writer as well worthy of note, because the careful understanding of each part, and the still more careful thinking this involves, impress all the little but very important details on the student's memory as nothing else can. For these reasons the draughtsman will surely find all labor spent in mastering such useful subjects of incalculable benefit to him in after years, bearing in mind that there is always room at the top for the expert.

### Annual Convention of Interstate Marble and Tile Men

The annual convention of the Interstate Marble and Tile Contractors' Association of New York and Pennsylvania was held in Elmira, N. Y., the past month. The following officers were chosen: President, Richard J. Watts, of Buffalo; vice-president, William Barriscale, of Scranton; treasurer, George B. Stearns, of Syracuse. Together with E. C. Purdy and Charles Gerstner, the officers make up the new board of directors. The next convention will be held in Buffalo.

### Quarry Notes

Morris Roppold, of Denver, has been appointed superintendent of the immense trap-rock quarries near Downingtown, Pa., operated by the Keystone Quarry Company.

It is expected that operations will be begun within three months by the recently incorporated Seneca Lake Limestone Corporation, at the Dresden stone quarry, near Penn Yan, N. Y. Power will be obtained from the Seneca Mills Electric Company, and from fifty to one hundred men will be employed. Ground limestone for fertilizing purposes will be the product.

The city of Helena, Mont., has established a municipal rock-pile at the old Kluge quarry. The reason for starting it was that the city was a favorite stopping place for tramps.

Ohio County, West Virginia, has just awarded contracts for crushed stone for road building during the coming year. The prices are all higher than last year, because of the general increase in the cost of labor.

The Stephensburg Stone Company, of Stephensburg, Ky., has been awarded the contract to furnish Ohio County, Ky., with 10,000 yards of stone for the construction of an eight-mile road.

### Business Brevities

A granite shaft to the memory of Colonel Michael Troutman Simmons, one of the earliest pioneers of Puget Sound, was unveiled near Tumwater, Wash., the past month. The spot where the monument stands is known as "the end of the Oregon trail."

Kentucky will operate a state quarry at Frankfort, the product being crushed limestone to be used for fertilizing purposes.

Nearly all the 300 strikers in the limestone quarries on Kelley Island, near Sandusky, O., have returned to work. Their demand for an increase in pay from 22 to 25 cents an hour was not granted.

Mrs. Margaret Parker, of Watertown, N. Y., left a will directing that her entire estate, amounting to \$15,000 to \$20,000, be expended in the erection of monuments over her grave and the grave of her parents.

The Monarch Cut Stone Company, of Clear Creek, Ind., has filed notice of dissolution.

The Modern Monument Company, of Sheboygan, Wis., is building a large addition to its plant.

For the purpose of improving trade conditions, the Brooklyn

and Long Island Mantel and Tile Dealers' Association of Brooklyn has been incorporated. The directors are George Miles, Morris G. Williams and Samuel N. Schechter, of Brooklyn.

A number of property owners at Edgemere, L. I., have raised the sum of \$10,000 for the construction of a granite seawall about fifty feet off shore at that point. It will be about 400 feet in length. The ocean is making considerable inroads on the beach at this place.

There is a controversy between the board of public works and the water board of Watertown, N. Y., with regard to crushed stone furnished by the latter to the former. The water board claims that it should be paid for all stone that it supplies.

An increase of 25 cents a day has been granted to all the employees of the Union Lime Company, at its plants at Marblehead and Hamilton, Wis.

The town of Clinton, Mass., has purchased a portable stone crusher.

A committee has been appointed in St. Paul, Minn., to make plans for the erection of a suitable memorial to the late James J. Hill. Louis Betz is chairman.

### Construction Notes

The Elks of Lebanon, Pa., will erect a new marble clubhouse, after designs by Architect A. A. Richter, of Lebanon and Reading.

Howard C. Brokaw has awarded to A. L. Mordecai & Sons, New York, the general contract for the erection of a three-story limestone-and-brick residence, together with garage and other outbuildings, at Brookville, L. I. The work will cost about \$100,000, and the plans are by Horace Trumbauer, of Philadelphia.

F. Westerman, of Cincinnati, will erect a stone-and-brick residence in Westwood, one of the suburbs of Cincinnati. The plans are by A. C. Kuball, of the latter city.

Plans have been filed for a 21-story limestone-and-brick building, costing \$987,650, at Seventh Avenue and Thirty-seventh Street, New York, for the Little Falls Company.

The Sisson Bros.-Welden Company will rebuild their store at Binghamton, N. Y., using St. Lawrence granite and Indiana limestone.

Plans have been filed for a 14-story hotel at 143 East Thirty-ninth Street, New York, for A. Stanley Jones. It will have a façade of limestone, brick and terra cotta. The architect is Arthur L. Harmon.

Thomas Newbold, of Hyde Park and New York, will erect a five-story residence, costing \$125,000 at 13 and 15 East Seventy-ninth Street, New York, after plans by McKim, Mead & White. The façade will be of limestone and brick.

Mrs. Catherine C. D. Rogers, of Tuxedo Park, N. Y., will erect a five-story residence on Seventy-ninth Street, New York, after plans by Trowbridge & Livingston. It will have a Gothic façade of Indiana limestone, and will cost about \$100,000.

The contract for the erection of the \$70,000 Masonic temple at Monroe, La., has been awarded to the Burkes Construction Company, of Hattiesburg, Miss. The building will be three stories high, and of stone. Work on the structure will be begun at once.

The Robert Hoe estate will erect a twenty-one-story office building, to cost about \$1,000,000, on Broadway and Thirty-seventh Street, New York. The plans are by Ernest Flagg. The front will be of limestone, brick and terra cotta.

Athol, Mass., will build a Carnegie library after plans by W. H. and H. McLean, 110 Tremont Street, Boston.

The First National Bank, of Wallace, Idaho, has awarded the contract for the erection of a three-story banking build-



ing, costing about \$50,000, to the Washington Construction Company, of Seattle, Wash.

Rouse & Goldstone have prepared plans for a sixteen-story loft building, costing about \$550,000, at 30 East Forty-second Street, New York, for I. R. Jacobs, C. H. Leland and A. E. Flint.

Kroger, Mayfield & Shaw Company, of El Paso, Tex., have been awarded the contract for the erection of the new St. Patrick's Cathedral in that city. It is expected to cost about \$150,000.

The city of Middletown, O., will erect a \$200,000 high school.

The First Baptist Church, of Chattanooga, Tenn., will build an addition to its edifice.

P. R. Lorenz, of Moline, Ill., has been awarded the contract for the erection of a new Y. M. C. A. building at Anderson, Ind., at \$133,340.

Baldwin & Pennington, 330 North Charles Street, Baltimore, have prepared plans for a new 3-story building for St Elizabeth's Home, in that city. It will cost about \$150,000.

T. T. Redick, of Fort Smith, Ark., has been awarded the contract for the new courthouse at Greenwood, Ark., at \$62,500.

Carneal & Johnston, of Richmond, Va., are preparing plans for a \$150,000 store in that city for J. B. Mosby & Co.

The contract for the erection of the \$330,000 Volunteer Life Insurance building in Chattanooga, Tenn., has been awarded to H. D. Watts & Co., Atlanta, Ga.

The Kanawha Banking and Trust Company, of Charleston, W. Va., is planning the erection of a ten-story building.

The Deaf and Dumb Institute, of Montreal, Que., will erect a building costing nearly \$300,000.

The contract will be awarded about August 15 for the erection of a new edifice for the First Baptist Church at Miami, Fla. The plans call for a structure costing about \$65,000.

Bids will be received until August 14 for the erection of a \$200,000 courthouse at Woodland, Cal.

The Seldenbreck Construction Company, of Ann Arbor, Mich., has been awarded the contract for the erection of a new library building for the University of Michigan. It will cost about \$350,000.

Hugh Fawcett, of Duluth, has been awarded the contract for the erection of the new courthouse at Hibbing, Mich. His bid was \$78,495.

The Franklin Trust Company will erect a ten-story stone and brick bank and office building at 20 South Fifteenth Street, Philadelphia. The plans are by Armond, Ashmead & Bickley, of that city.

The Tower Club will erect a three-story stone-and-brick clubhouse at Princeton, N. J. The plans are by Roderic B. Barnes, 15 East Fortieth Street, New York.

### Obituary Notes

Frederick Andres, sixty years of age, and sole owner of the Andres Stone and Marble Company, of Milwaukee, one of the largest concerns of its kind in the country, died at his home in that city on July 23, after an illness of four months. Mr. Andres was born in Bridgeport, Conn., and two years later went to Milwaukee with his parents and had lived in that city since. At his father's and brother's deaths in 1880 he became manager of the marble and store business. Due to his efforts in the business the amount of work done annually has increased to \$500,000 in the last year. He is survived by his widow and two sons, Edgar, 28 years old, and Melvin, 22 years old. Edgar has been in his father's business for six years and Melvin for the last year and a half. Both will assume the responsibilities of the business, which has just been incorporated. Besides the Milwaukee establishment,

Fred Andres was the organizer and sole owner of the Tennessee Marble Quarries Company at Marco, Tenn.; mill and finishing establishment at Vestal, Tenn., and operator of quarries at Victor, Ind. Among the biggest jobs which Mr. Andres had done are the stone and marble work for the Milwaukee public library, Milwaukee city hall, the Continental Commercial Bank at Chicago, Cleveland city hall, Minnesota state capitol, Detroit municipal building and two wings of the Wisconsin state capitol.

### New Companies

Marr & Gordon Company, Inc., of Barre, Vt., to quarry and deal in granite. Capital, \$50,000. Incorporators: Alexander Gordon, George Mutch and William Calder, Barre.

The Greenfield Stone Company, of Greenfield, O., to quarry and deal in stone. Capital, \$50,000. Incorporators, Harry L. Gordon and others.

The Andres Stone & Marble Company, of Keefe and Richards streets, Milwaukee, Wis., to do a general stone business. Capital, \$300,000. Incorporators: F. E. S. Richter, E. F. and M. V. Andres.

Frank P. Bauer Marble Company, of Chicago, to manufacture and deal in marble. Capital, \$5,000. Incorporators: Frank P. Bauer, Henry A. Hoban, A. M. Bauer.

### Trade Notes

The Tompkins-Kiel Marble Company, 505 Fifth Avenue, New York, announce that they expect the immediate arrival of a consignment of Tavernelle Bianco and Tavernelle Rose and Fleuri marble. This is in various sized blocks, a good proportion of them being large ones. The company has also received large consignments of Champville, Black and Gold, Traniville, Blanco P. and Italian marbles and Travertine stone. Also a large supply of Tennessee marble.

On July 1 the Seattle office of the Lidgerwood Manufacturing Company was removed from its former location, 807-809 Western Avenue, to their new quarters at 63-65 Columbia Street.

### Business Embarrassments

As the result of a suit in the district court of Colorado, the Colorado-Yule Marble Company has been placed in the hands of J. F. Manning, the president, as receiver. The company has a capital of \$10,000,000, of which \$3,000,000 is in bonds. Outside of the bonded debt, the company owes about \$200,000 to various creditors, the largest one being the Colorado National Bank, of Denver. The action was entirely friendly, and it is expected that the company will be reorganized within a year. In commenting upon the failure, a Denver newspaper says: "In the last six months several attempts have been made to reorganize the company and put it on a sound financial basis, but owing to the varied interests, which were scattered all over the United States, it was found impossible to get them together, and they could not be made to realize the importance or necessity for reorganization. Therefore the holders of the underlying bonds brought suit for foreclosure, and at the same time applied for a receiver. All debts will be paid as quickly as possible."

John T. Condit, a granite man of Berlin, Wis., has filed a voluntary petition in bankruptcy, with liabilities of \$1,520, and assets of \$2,820.

The Rensselaer Stone Company, formerly of 82 Church Street, New Haven, Conn., has been granted a discharge in bankruptcy.

Hampton D. Ewing, 67 Wall Street, New York, has been appointed receiver of the John Liddle Cut Stone Company, 462 East 107th Street, New York.

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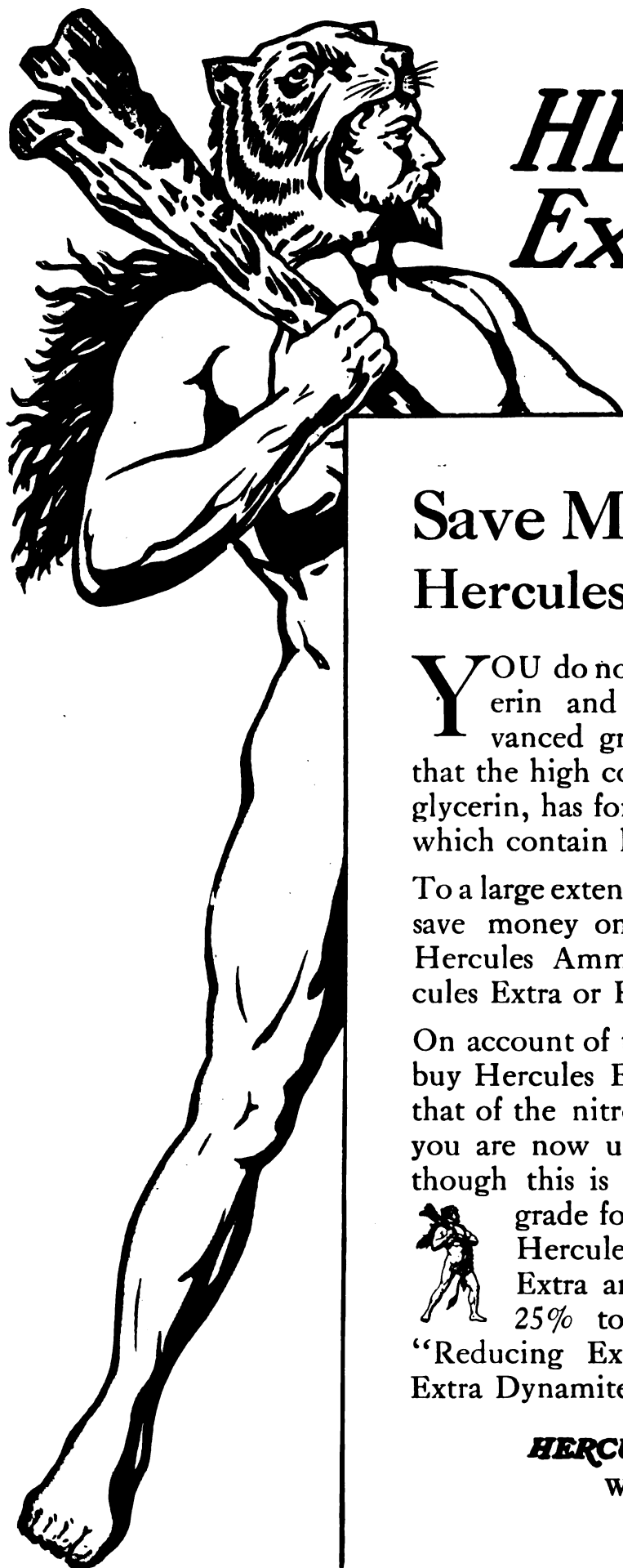
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He never had a rubbing bed, and did not like the idea of such a clumsy awkward affair, he thought joints should be a simpler operation. He never saw a lumber mill use a sand paper disc to "edge" a board and could not see why marble should not be worked on the same principle as wood. He had an idea that joints should be cut with a thin Carborundum wheel. There were several machines offered as "coping machines" to do the work. There was only one "JOINTING MACHINE" in the lot, only one machine in which the wheel cut through into a groove and made a clean, perfect joint every time. All the others left a fin on the bottom edge, they were COPING machines only (had to rub the joints afterwards).

He backed his judgment and logic against the assertions of MR. CAN'T B. DUNN and bought one of our JOINTING machines, here is what he has to say:

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Yours very truly,

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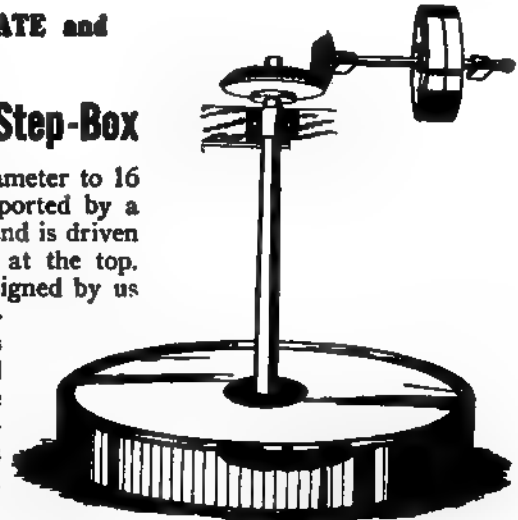
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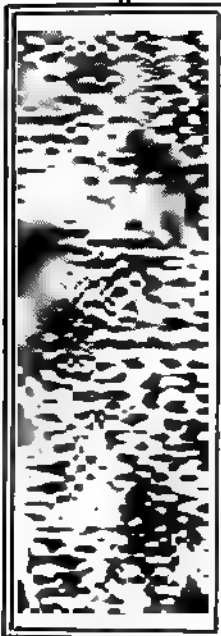
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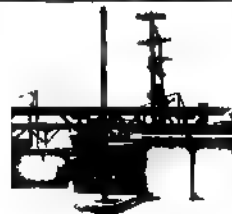
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Indirectly, too, the granite industry plays an important part in the economy of the State, giving as the export does, a considerable profit to shipping. The importance to shipping will be seen when it is stated that in 1913, 71,000 tons were exported to Argentina alone, the freight charges being in excess of the value of the goods f. o. b. steamer in Norway.

Up to 1904 Great Britain had been the one great foreign market for Norwegian granite, exports to this country having increased from 69,289 tons in 1900 to 149,078 tons in 1904. From the latter date exports to Great Britain began to decrease rapidly, until by 1913 they had declined to only 37,301 tons. During this period, however, other markets had been found for Norway's granite, especially in Argentina and Belgium. These two countries took in 1913 a total of 71,215 tons and 45,171 tons, respectively.

The Norwegian granite industry depends largely upon the export trade for its prosperity, and for this reason is confined chiefly to the district near the entrance of the Christianiafjord, between this and the Swedish frontier. Export to a less extent takes place also from the Drammen district and from Larvik of the so-called larvikite, or "labrador." The most important quarries are situated at Iddefjord, near the Swedish frontier, known as the Smaalenene district, where 70 to 80 per cent. of Norway's granite is produced. Hvaler, the group of islands at the entrance of the fjord, form also an important district, in which many quarries are found, the largest being the Sand quarry on Skjaeren.

The Norwegian quarries are worked, on the whole, in the same manner as in other countries, although modern improvements in the way of machinery, transport rails, etc., are not so far advanced as in other

places. The quarries are generally quite close to tide-water, and the granite lies near the surface and in large tracts, entirely exposed and free from foreign material. They are consequently easily worked and require little machinery and less handling than in other parts of the world. Only such stone as is easily accessible is worked, and it is so near the surface that deep cuttings are not required. The quarries generally are small, and it is therefore not convenient to employ much machinery.

As regards its quality, a series of tests have been made which prove that it is a very solid material with an extremely high resistance to pressure, exceeding that for granite in general. The investigations also show that Norwegian stone belongs to the best classes for quality and stands high in its resistance to frost and surface disintegration.

The polishing branch of the industry is still in a rather primitive state. Methods that were discarded in the United States many years ago are still used here. None of the excellent machinery with which American granite is polished is known in this country, and until it is introduced and this part of the industry brought up to date, Norwegian exporters will be unable to compete with American manufacturers in the United States market.

The working days in the quarries during the summer months consist of 10 hours, except on Saturdays, when they are only 6½ hours, making for the week 56½ hours. During the winter months, when there are so few hours of daylight, the hours of employment are only 7 per day, or a total of 42 for the week.

Quarrymen and journeymen are paid on the average 13.40 cents per hour and granite cutters from 16 cents to 20 cents per hour. These rates, however, are very seldom used, as practically all work is paid for by the piece. Quarrymen apprentices are unknown in Norway, except in cases where a boy sometimes helps his father when doing piecework. Granite cutters' and paving cutters' apprentices receive from \$2.70 to \$4 per week.

Paving cutters work entirely on the piecework system. It is impossible to state the rate of earnings per

hour, as there is no supervision of the workmen and no account kept of the time consumed on each job.

The cost of transportation from the quarry to tide-water depends entirely upon the location of the quarry. In many cases there is no cost whatever, as the quarries are often situated right on the water and a crane is all that is necessary to load the granite into the boat.

The cost per cubic foot on rough granite as quarried is as follows: Gray granite, \$0.80; red granite, \$0.94; black granite, \$1.34. The cost per linear foot on dressed curbstone is about 54 cents, including the material. Cost per square foot of dressed granite surfaces is 36 cents for dressing 1 superficial foot (10 cut). Paving blocks of an average size and finish cost 48 cents per 1,000.

Steel used in the manufacture of tools for quarrying and cutting has about trebled in price since the war, and now costs 8½ cents per pound. The powder used costs 17 cents per pound, which is about double the price in normal times.

While most other industries in Norway are enjoying the greatest prosperity, the granite industry has been severely hit by the war. With the increased cost of building materials and labor, building operations have practically ceased. Very few building contracts are being made and therefore the demand for building stones is small compared with what it was in former years. The export trade has been greatly hindered by the high freights which have prevailed since the breaking out of the war. Only about 10 per cent. of the workmen normally employed in this industry are at present occupied.

### The Marble Industry of Greece

The marble industry in Greece is largely in the hands of a single company, which has offices in New York as well as in various European cities, writes Consul-General Alexander W. Weddell, from Athens. The following data, communicated by the manager of this company, relating to its operations in the past two years, is a fair reflection of conditions throughout the trade in Greece, practically all the quarries are located in the Athens consular district:

The amount of Pentelic white marble quarried in 1915 was about equal to that of 1914, yet the output from the colored quarries has practically discontinued, with the exception of Tinos green marble, owing to conditions arising out of the European war. The American market consumed the bulk of the Tinos green produced, otherwise this property would also have had to shut down. The London market absorbs the best quality produced from the Pentelic white marble quarries, while the local market took the remainder, which, of course, was of second and third quality. Owing to shipments having entirely ceased to the Antwerp and Hamburg depots, where in the past large quantities of colored Skyros, Pentelic white,

Tinos green, and Verde Antico marbles were used, the business has been seriously affected; in fact, during the past year only Pentelic and Tinos marbles have been quarried, the former during most of the year and the latter for five months. Toward the end of the year there was a small amount of the Verde Antico marble quarried, but owing to a lack of orders all of our properties have now been shut down.

Freight rates to London are now double what they were before the war, while to America they have increased about 30 per cent. This, together with war conditions, doubtless accounts for the decreased trade with Great Britain. It was hoped, however, that the American market would import large quantities of marble, owing to the more favorable conditions prevailing there. Up to the end of 1915 the increased freight rates to the United States had not yet gone into effect. High freight rates, therefore, do not account for the recent falling off in orders from that quarter.

The local business has practically ceased, probably because of the high cost of other classes of building material, thereby preventing the construction of new buildings.

Comparative figures of production in cubic meters (1 cubic meter equals 35.314 cubic feet) for the two years past by this company, which controls practically the entire field, are as follows:

Kinds.	1914.	1915.
	Cu. m.	Cu. m.
Pentelic, white.....	450	501
Skyros, colored.....	273	4
Tinos, green.....	370	232
Larissa Verde Antico.....	109	10
Total .....	1,202	747

### Big Marble Suit Settled by Compromise

The suit of the Colorado Yule Marble Company against the Pacific States Corporation, involving the balance alleged to be due for marble furnished for the Merritt Building in Los Angeles has been settled by compromise, the building corporation confessing judgment for \$10,000.

Before the case was called the attorneys representing both sides got together and entered into a stipulation. The marble company had gathered 10,000 exhibits to be used in the course of the trial. These included time cards, sheets from the time clocks, sketches of block marble and many other things intended to prove the claims. The corporation, owner of the building, claimed damages approximately in the amount of \$14,000.

Weeks had been consumed in preparing for the trial, and hundreds of details covering the terms of the contract and the cost of quarrying and providing the marble were to be threshed out.

## Physical Properties of Marble

**M**ARBLES differ greatly in their capacity for transmitting light. The more translucent varieties, if fine grained, are best adapted for novelties or other ornamental purposes. Some marbles are waxy in appearance, and this property seems to be related to translucence, writes Oliver Bowles in "The Technology of Marble Quarrying," published by the Bureau of Mines, Washington. Dale gives the depths to which certain foreign marbles will admit light. They are as follows: Best Pentelicon, 0.59 inch; Parian, 1.37 inches; Carrara statuary, 1.18 to 1.57 inches. The reputation of some marbles depends greatly upon this quality. As far as is known, no figures have been obtained for the depth of light penetration into American marbles. Certain beds of Alabama marble are notably translucent. The same quality has been observed in marbles from Massachusetts, Ver-

marble mass are crystalline and have a definite rhombohedral cleavage. They are mostly twinned. Both the cleavage and the twinning of each grain are independent as relating to other grains. The texture is usually about the same in all directions, though in some marbles an elongation of grains in one direction has been noted. This characteristic is discussed more fully under the heading "Rift." The degree of interlocking of grains, and other features of cohesion have a definite relation to crushing strength, porosity, and workability. In certain dolomitic marbles the grains of dolomite may differ greatly in size and shape from those of calcite. The difference in grain diameter between the larger and smaller grains in some marbles is rather marked, and in others is small. Uniformity of grain is desirable. The size of grain is commonly described as fine, medium, or coarse. Such terms are indefinite, and may

POTTER MEMORIAL PULPIT AT ST. JOHN'S CATHEDRAL, NEW YORK  
The gift of Mrs. Russell Sage in memory of the late Bishop Potter. Designed by Henry Vaughan, Boston. Carved in Tennessee marble by John Evans & Son, Boston

mont, and Colorado. Certain modes of artificial treatment are known to increase the translucence of marble. Usually the effects of such treatment are far less permanent than the material itself, and consequently are not to be recommended.

The grains of calcite and dolomite that make up a

have quite different meanings with different individuals, the interpretation being dependent upon the range of texture experienced by the observer.

The texture of marble is influenced by impurities such as graphite, sericite, tremolite, actinolite, and mica; and also by the folding or plication of the beds.

The latter may cause elongation of grain or granulation of certain parts of the mass.

The terms rift and grain are used synonymously for the direction of easiest splitting in marble. The rift is usually parallel with the bedding. It is probably due to elongation of grain caused by pressure. Dale, whose microscopic study of marbles has been extensive, states that "in some marbles one or two axes of the grains are much longer than the others, and the longer axes of different grains are parallel, giving the rock a certain schistosity which is usually parallel to the bedding."

The rift may be emphasized by the presence of fibrous or platy minerals such as scales of mica or graphite or needles of actinolite. These usually occupy positions with their long axes parallel to the direction of grain elongation, and thus increase the tendency to split in that direction.

Rift is a property of marble that the quarryman should take into account in planning operations. By taking advantage of this ease of splitting, drill holes for wedging may be spaced much farther apart than if no rift exists.

Porosity is the volume of pore space expressed as a percentage of the total volume of the rock mass. The pore space of marbles is usually much less than that of limestones and sandstones, and more than that of granites, though exceptions towards both extremes are known. It varies from 0.0002 to 0.4 per cent.

A method of determining pore space may be quoted from Parks, as follows: The specific gravity is determined as already indicated and the test piece, full of water, is weighed. The difference between this weight and the dry weight of the sample gives the weight of the included water. If this latter figure be multiplied by the specific gravity of the stone, we obtain an expression which represents the weight of the stone which would be required to fill the pores. If this amount be now added to the weight of the dry sample, the result is the weight of that sample, provided that there were no pore spaces. This weight divided into the weight of the stone required to fill the pores, and multiplied by 100, gives the percentage of pore space in the stone.

Porosity is commonly expressed as "ratio of absorption," which is the percentage by weight that the absorbed water bears to the dry weight of the stone. The specimen is dried in a hot-air bath at a temperature of about 110° C. until the weight is constant. The stone is then immersed in water for a period of time varying from two days to several weeks. The process of absorption may be assisted by boiling or by placing the immersed block beneath the receiver of an air pump as already described. The difference in weight between the dry and the saturated specimens is the weight of absorbed water. The ratio of absorption of American marbles as determined by the Bureau of Standards varies from 0.0018 to 0.00007.

The strength of a stone is the measure of its capacity to resist stresses of various kinds. It depends partly on the rift of the rock and on the cleavage and hardness of the grains, and partly on the state of aggregation, including degree of cohesion, interlocking of grains, and nature of cementing material, if such is present. Although strength alone is not a sure criterion of durability, a knowledge of the capability of any stone to withstand stresses of various kinds is of great value if the material is to be used for purposes involving extraordinary strains.

Many tests have been made of the strength of building stones. It was early learned from these tests that most stones have many times the strength required for ordinary uses. As pointed out by Buckley, ordinary building stones have 2 to 10 times the crushing strength required in any structure for which they may be used. As a consequence of a recognition of this fact, there was a reaction against making tests, which were regarded as superfluous. An increased demand for strength in structural stone and a wider knowledge of the significance of strain resistance has lately led to a renewed interest in strength tests. It is known that stones are less durable when exposed to intense strains, and it seems reasonable to conclude that the rate of disintegration increases with proportional rapidity as the strain to which the rock is subjected approaches more and more nearly to the ultimate load it is capable of bearing. Rock strength may therefore have a decided influence on the rate of disintegration, even when it is evident that the strength is far in excess of the requirements.

The tests commonly made are for crushing strength, transverse strength, elasticity, and shearing. As tests can be made only with high-priced specially designed equipment, which is available to few people, a description of the methods of testing is omitted, and the discussion confined to a brief consideration of the significance of the various types of stress resistance of which rocks are capable.

As already stated, most rocks that, after ordinary superficial inspection, would be chosen for structural purposes, have many times the crushing strength required for ordinary uses. For certain purposes, however, such as bridge piers, abutments, columns, and the base blocks of very high structures, crushing strength demands more than ordinary attention. The tendency, more noticeable every year, to increase the height and superincumbent weight of great city structures makes strength tests more and more useful.

Rock structures have a definite influence on strength. As a rule rocks will bear a greater compressive stress across the bedding plane than parallel with the bedding plane. Hence stones should not be laid with the bedding planes vertical.

Transverse strength may be measured by testing the capability of a bar of stone supported at its ends to bear weight exerted at its center. Such tests indicate

the suitability of a marble for door or window caps, or as bridging material that must bear a heavy load. Breakage of such caps, however, must not always be attributed to a weakness in the material employed, as unequal settling or improper laying may be the chief causes.

When subjected to crushing strain rocks are capable of being appreciably compressed before rupture takes place. A measure of this compressibility in terms of the load is what is known as the modulus of elasticity. Parks defines it more explicitly as follows: "The decrease in length of a bar of material thus subjected to pressure divided into the original length of the bar, and multiplied by the load in pounds per square inch, gives what is known as Young's modulus or the modulus of elasticity or compressibility." Merrill found that after relief from intense pressure below the point of rupture rocks failed to completely recover their original form. This he termed a permanent "set."

Compressibility may be the cause of cracks in the lower courses of certain large structures. It is evident

those of an adjoining part, the settling will not be uniform. Such settling can take place only under extremely heavy loads. A knowledge of the elasticity of marble is, as quoted by Buckley, "valuable in determining the effect of combining masonry and metal or of joining new masonry to old; in calculating the effect of loading a masonry arch; in proportioning abutments and piers of railroad bridges subject to shock, etc."

The tendency to shear—that is, the tendency of one part of a block to slide laterally with respect to another part—is strong in certain structures, such as massive arches and lintels. Certain blocks in large buildings are subjected to strains in different directions, and the tendency to shear may be pronounced. Thus, shearing tests of marble designed for such purposes are of value.

### The New Pulpit of St. John's

On Sunday, September 10, the new Gothic pulpit at the Cathedral of St. John the Divine, New York,

BACK VIEW, POTTER MEMORIAL PULPIT, ST. JOHN'S CATHEDRAL, NEW YORK

This pulpit, the gift of Mrs. Russell Sage in memory of the late Bishop Potter, was dedicated the present month. It is carved in Tennessee marble by John Evans & Son, Boston.  
Architect: Henry Vaughan, Boston

that building stones having a low modulus of elasticity may under heavy superincumbent load be appreciably compressed with a resultant settling of the structure, and if one part of the building is composed of blocks having a different modulus of elasticity from

was dedicated. This pulpit, which is one of the most elaborately carved of any in the world, was the gift of Mrs. Russell Sage in memory of the late Rt. Rev. Henry C. Potter, Bishop of New York.

The pulpit, which stands at the crossing at the left



of the choir, is built of Tennessee marble, and has a quartered oak sounding board; both are richly carved. Henry Vaughan, of Boston, who has built many of the Cathedral memorials, is the architect.

The structure has six sides, and is eleven feet high and fifteen long and six and one-half wide. On the upper part are carved these scenes from the life of Christ, enclosed in Gothic portals: The Nativity, Christ Questioning the Doctors, The Crucifixion, The Resurrection, and The Supper at Emaus. The backgrounds are in bas-relief, and depth and space are given to the subjects. Single figures of saints and ecclesiastics stand in small niches at the angles. These are St. Jerome, St. Gregory, St. Chrysostom, St. Peter, St. Paul, Latimer, Bossuet, and Phillips Brooks. Below these figures are bands of grapevines, passion and tablet flowers, and at the angles small busts of choristers.

On the base between the slender flowered pillars are the symbols of the Evangelists: the angel, the lion, the ox, and the eagle. The central column is formed of five flat Gothic portals. The shields of the church and the sacred flowers ornament the lowest part of the base. Statues of St. John the Baptist and Isaiah stand on the posts of the balustrade of pierced tracery. The faces of all the figures have an animation which is not often found in modern church sculpture.

The sounding board, which is carved in exquisite Gothic ornaments, is supported by two narrow, open arches and by a wide panel at the rear, into which a door is cut leading to the stairs. Over this doorway is carved a church shield with the letters I. H. S. The following inscription encircles the top of the board: "Glory be to God on high, and on earth peace, goodwill toward men. We praise thee. We bless thee. We worship thee. We glorify thee. We give thanks to thee for thy great glory: O Lord God, Heavenly King."

The stoneworking and carving of the pulpit was done by John Evans & Son, Boston, Mass. It is a remarkable addition to the notable stonework that has recently found place in the churches of the country.

### Prices of Mica Go Up

The quantity of sheet mica, rough trimmed and cut, produced in the United States in 1915, is smaller than that for any of the twelve preceding years, but the value of the product is the highest ever recorded. Statistics collected by the United States Geological Survey, Department of the Interior, recently published, show that high prices have produced a prosperous condition in the mica-mining industry in certain parts of the country, so that, as one correspondent in the South writes, "Everybody and their children are digging for mica."

The average price of sheet mica in 1915 was 68 cents a pound, compared with 50 cents a pound in 1914 and

21 cents a pound in 1913. The total value of all sheet and scrap mica produced in 1915 was \$428,769, a value exceeded, though but slightly, only by that for 1913. Scrap mica did not change much in value. North Carolina produced more than half the output, New Hampshire, Idaho and South Dakota being relatively the next largest producers. There was a small production of lepidolite (a lithia mica) in California, of clinochlore (a chlorite related to mica) in Georgia, and biotite (a dark mica) in Colorado. The value of the mica imported in 1915 exceeded the value of the mica produced in that year.

### Personal

The long-established cut-stone yard of Thomas Young & Co., 6349 Chew street, Germantown, Pa., has been purchased by William G. Drew, a member of the firm, who with his son will conduct the business under the firm name of William G. Drew & Son.

Mr. Edgar J. Moeller and Mr. Harry B. Mulliken announce the dissolution of the firm of Mulliken & Moeller, architects, New York. Mr. Moeller and Mr. Mulliken will each continue the practice of architecture individually in their present offices in the Terminal Building, 103 Park avenue, New York.

### Death of a Well-Known Stone Man

John A. Hunter, one of the most widely known stone operators of the Bloomington district, died at his home in that city a few days ago. Mr. Hunter had been in ill health for more than a year. He was a son of Morton C. Hunter, a former Congressman from that district, and was born and reared in Bloomington. For many years he had been engaged in the quarrying of Indiana limestone and had developed some notable quarries.

### To Clean Marble

The following recipe is given: To clean marble take two parts of common soda, one part of pumice stone and one part of finely powdered salt. Sift the mixture through a fine sieve and mix it with water, then rub it well all over the marble and the stains will be removed. Rub the marble over with salt and water. Wash off and wipe dry.

### May Reopen a Big Quarry

Negotiations for resuming work at a large quarry at King's Cave, on the New Albany and Corydon Pike, fourteen miles west of New Albany, Ind., are being made. Capitalists from the Bedford and Bloomington district have been interested since disposing of their holdings in that section a year ago and a syndicate has employed George Schar to pump water from the quarry and drain it. Should the quarry be reopened, it will furnish employment to 300 men. The quarry was in operation about ten years ago.

## Problems in Granite Quarrying



THE problems that confront the granite quarrymen are numerous, says T. Nelson Dale. Their solution requires not only capital, but practical experience, judgment, a little geological knowledge, and some mathematics. It is, first of all, assumed that suitably prepared specimens of the fresh rock have been scientifically determined as to quality.

The next step is a careful exploration of the granite surface, if necessary, by stripping in trenches, with a view to determine the areal extent of the quality of stone tested, the character of the jointing, the presence of headings, dikes and veins, and the frequency of knots.

**Stripping.**—The thickness of soil or till upon the granite surface and that of the decomposed surface of rock should be estimated. In some places the removal of this covering involves large expenditures; in others the expense is so small as to be negligible.

**Sheets, Rift and Grain.**—A sufficient amount of vertical exploration should be made, possibly by core drilling, in order to determine the thickness of the sheets, the width of the sap, the direction and amount of rift and grain.

**Quarry Site.**—With these preliminaries a quarry site should be selected. In this selection the inclination of the sheets and the location of headings and dikes should be considered, as well as the amount of stripping, the location of dumps, the drainage, and the facilities for transportation. The location of a quarry on a level tract, away from streams or shore, may entail insurmountable drainage difficulties.

**Transportation.**—The cost of transporting the product is obviously one of the great factors in granite quarrying. The location of quarries at tidewater is a great advantage. But in any case the transportation of the product any considerable distance by teams to railroad or wharf is a very serious drawback. When the quarry is at a considerable elevation above the railroad or wharf, elaborate systems of gravity rail transportation must be provided.

**Drainage.**—In small and newly opened quarries drainage is an insignificant matter, but as the quarry deepens it assumes importance. Where the quarry stands at some elevation the drainage is easily disposed of by ordinary piping or siphoning, but if the quarry bottom lies below the level of the surrounding tract and if the drainage exceeds the needs of the boilers, pumping must be resorted to; but even in such places there must be some available stream or short to carry off the water. The amount of pumping requisite varies greatly.

**Water Supply.**—When the needs of the boilers exceed the amount supplied by the drainage, neighboring springs or brooks are resorted to. On small islands that are without streams or copious springs the ques-

tion of water supply in large quantities is a serious one. In order to obviate expensive piping, bored wells are being resorted to. It is only the joint and sheet structure that makes granite a source of water.

**Use of Explosives and Wedges.**—At no point in granite quarrying is more experience and judgment requisite than in the use of explosives. The selection of the place for blasting, the size and shape of the hole, the selection of the powder, and the size of the charge are all matters requiring careful consideration. The thickness of the sheet, the proximity of joints, the porousness of the stone, its rift and grain structure, the

WADDELL MEMORIAL FOUNTAIN, WINNIPEG, MAN.  
Recently erected in Central Park in that city Architect: J. Manuel, F. R. I. A., Winnipeg Cut stone contractor.  
William Penn Stone Company, Minneapolis, Minn.  
Erected of Buff Bedford Limestone from the  
Indiana Quarries Company, Chicago, Ill

physical and mathematical laws governing the action of explosives, and the direction in which the quarrymen desires to split the mass are all factors in each problem.

The practice of foremen in granite quarries are frequently found to be as follows: Vertical blast holes

almost as deep as the thickness of the sheet are drilled by pneumatic or steam drills along a proposed line of fracture under three sets of conditions. The block to be loosened must be: (a) Bounded laterally by two free ends (consisting either of two artificial channels or two joints or headings or dikes, or else of one of these and one channel) and bounded the other way by one quarried face and the desired line of fracture; or (b) bounded laterally by one channel and the proposed line of fracture and the other way by a heading or joint and a free face; or (c) not bounded laterally by any free end and the other way only by the working face. In this case after the fracture is made the two other sides of the block must be cut either by blasting or splitting. In all these cases the boundaries of the block are the upper and lower surfaces of the sheets, and the lines of fracture must follow either the rift or the grain. Where the grain is weak it requires double the number of blast holes to effect a fracture along it than it does along the rift. Where there is no vertical rift or grain it is impracticable to use method (c), and in such cases, even with two free ends, channeling is resorted to.

Exceptionally, still another method is in use, which requires only one lateral joint face and one working face (besides the sheet surfaces), the line of fracture forming the third side. But this method is regarded as hazardous by the more experienced men, for the fracture is apt to leave its direction of parallelism to the working face and swerve off diagonally to meet it.

The blast holes are usually "lewis holes," which consist of two or three continuous drill holes, with the intervening rock chiseled out, or, where less force is required, "knox holes," consisting of a circular drill hole, with two diametrically opposite lateral vertical grooves. The drill holes may be made divergent below. The "channels" are about four feet wide and are made either by drilling blast holes in zigzag order, which are fired singly in diagonal order, or by drilling holes on both sides of the proposed channel in close order: or else the channel consists of a single row of contiguous drill holes. This practice is found more economical than that of using a regular channeling machine. When the stone is delicate, powder is used sparingly or not at all. In the latter case channeling is done in two directions at 90 degrees, and the operation is completed by splitting by wedges in the third.

After the block has been loosened by methods (a, b, or c), it is broken up into minor blocks by "splitting." Splitting is now done almost entirely by the use of pneumatic plug drills. The holes are three to four inches deep,  $\frac{3}{4}$ -inch in diameter, and a few inches apart. Every few feet a deeper hole is drilled. Iron wedges are then very gradually driven in between steel side pieces called "feathers."

A difference is found in blasting and splitting granite in winter and summer. A low temperature increases its cohesiveness, but probably in connection

with water, increases its fissility where the rift is feeble.

The method recently adopted in granite quarries develops an incipient sheet structure by the use of high explosives followed by the application of compressed air.

### Reorganization of the National Limestone Company

The Federal Court at Martinsburg, W. Va., has issued a decree of foreclosure of the mortgage and sale of the property of the National Limestone Company, of Berkeley County, W. Va., to satisfy the claim of the Northern Central Trust Company, of Scranton, Pa., which holds the greater portion of the bonded indebtedness of \$1,500,000 of the limestone company. The foreclosure and sale is a part of the agreement for reorganization recently reached between the warring factions of stockholders. The property will be purchased by the Reorganization Committee for the stockholders. The plant will be reopened within a short time.

### Key Memorial at Fort McHenry

Nearly 102 years ago a powerful British fleet appeared off Baltimore and worked its way up the Patapsco River until within striking distance of the city's principal defence, Fort McHenry. Those were the days of short-range cannon, when attacking craft must needs draw close to plant shot and shell on their objective. We all know how sturdily the defenders of that fort retaliated, and that haughty Admiral Cochrane was obliged to sail away without carrying out his vaunted boast that he would reduce "that nest of pirates to a heap of ashes," says an exchange.

Fort McHenry was rightly endeared to Marylanders and long retained its dignity as one of our coastal strongholds. But time has changed all this. Long-range guns have shown batteries at the old fort to be of little potential value. Therefore, the Government has virtually abandoned Fort McHenry, and Baltimore intends to turn the site into a beautiful park as a reminder of the days when its quaint old smooth bores held the British at bay and probably saved the nation.

It is therefore singularly appropriate that the Federal Government, after more than a century, should provide the money for the erection upon this historic spot of a monument to Francis Scott Key, author of "The Star Spangled Banner." Competitive designs were submitted, and the Secretary of War has recently approved the choice of the jury appointed to make the award.

The successful model was that submitted by Charles Henry Niehaus of New Rochelle, N. Y. On a low pedestal stands a heroic figure of a half clad man playing on a stringed instrument and symbolizing primitive music. Around the base of the pedestal, which will be ornamented in low relief, will be inscribed a verse from "The Star Spangled Banner."

## Explosives in Quarrying Work



**W**HILE there have been many articles giving a description of methods to be followed in blasting for quarry work, these have to do, in general with the drilling of holes, the placing of charges, and the methods of firing. Few writers have considered the nature of the explosives and their method of operation. Some time ago an English engineer, O. W. Howarth, considered this question at length, and his conclusions are of prime importance.

It will be remembered that in the discharge of all ordinary explosives, says Mr. Howarth, two distinct results accompany its decomposition, and contribute to the amount of energy exerted by it, viz., (1) the formation of a volume of gas occupying some hundreds of times more space than the solid charge, and (2) the simultaneous development of a high temperature by which its expansive force is further multiplied. The dynamic value of an explosive depends, therefore, upon the proportion between the bulk of the original charge and the space which would be occupied by the resulting gases at normal outside pressures, and at the temperature of their combustion, that is to say, the space they would occupy were there no resistance beyond that of the general surrounding medium, whether atmosphere or otherwise. Hence the rock-breaking capacity of the same charge would be considerably modified, according to whether it were employed in a vacuum—say outside the earth's atmosphere—or at the bottom of an ocean two miles deep. Similarly it would vary if the temperature of the surrounding medium were that of the sun's atmosphere or the absolute zero of space. Of course, none of these extremes occur in ordinary practice; but the variation within smaller limits is not to be disregarded. The useful energy of a charge exploded at the top of a mountain 15,000 feet high would be appreciably greater than if the same were used at the bottom of a harbor under 20 or 30 feet of water.

It is not always realized that what is commonly called an explosion is a process occupying a measurable and variable amount of time. No explosion is absolutely instantaneous; nor, on the other hand, is there any defined point of speed at which it might cease to be described as an explosion. There are plenty of illustrations of this fact. The curiously unstable compound known to chemists as iodide of ammonium (prepared by soaking iodine in an aqueous solution of ammonia gas and drying it) explodes by friction on being touched with a feather; and with such extreme rapidity that it may even be exploded by allowing a portion to drop upon a sheet of water—showing the speed of the explosion to be such that it is over before the powder has time even to absorb a particle of it. Contrasted with this is the time often occupied by the explosion of a mixture of gas and air

accumulated in a mine or in a house, which may vary, according to its composition, from a fraction of a second down to a rate of combustion which could hardly be called explosive. From these considerations arises the importance of the question as to what speed of combustion gives the best effect in rock breaking; and here the element of heat plays an essential part.

It is obvious that a given number of heat units generated at the point of explosion almost simultaneously, and quickly dissipated around the same point will do less expansive duty than the same number of units spread over a somewhat longer period, and thus able to maintain the temperature of the accompanying gas for an appreciable time. The degree of speed, or we might rather say the degree of slowness, of an explosion thus becomes an important item of adjustment

### WELL-DRILL HOLES FOR QUARRYING

Preparing for a big blast in a quarry that is to throw down many thousands of tons of rocks by the use of a great amount of high explosives

with a view to obtain the highest useful effect. Practically every miner is aware of this—though perhaps only by rule of thumb—when he varies his grade of dynamite, or uses a certain proportion of black powder to assist its action.

The same theory applies (though perhaps less obviously) to the means employed to originate the explosion. It is very well known that many of the modern explosives, such as cordite or melinite, will burn off quietly on the application of an ordinary flame and, in fact, cannot be made to explode without the use of a detonator or its equivalent. In this case the process is similar. The particles of explosive nearest to the source of heat are raised gradually to their point of combustion; and when this comes about, they in turn gradually raise the particles adjacent, so that the action proceeds with comparative slowness. But an application of the necessary heat to the first particle with such speed that none of it has time to

disperse determines its explosion, which operates in like manner on the next and throughout the mass. From this we may derive some assurance that accidental explosions—too often reckoned unaccountable—are actually due (however unlikely it may seem) to a sudden concentration of combustion heat at some one point from which it has no time to disperse. A slight slip of the knife during the objectionable act of slicing a stick of dynamite might suffice to bring this about, imperceptibly even to the unfortunate victim. This is not unfrequently done with the intent to enhance the strength of a shot by making it burn quicker, while the same operator adds with the other hand a modicum of black powder in order to make it burn slower!

It is admitted that the desideratum in speed must remain to some extent a matter of local experiment. Every shot has, in fact, to take its chances; for the reason that no man can see, at the bottom of a drill hole, what are the precise opportunities for the gas and heat of a given charge to disperse themselves. The practical question under this head is, therefore, what are the visible or ascertainable conditions by which the most effective speed and strength can be ensured. The general quality and structure of the substance to be broken must of course be the main factor in determining how it is to be decided; and when the general principles governing these are sufficiently understood, the local conditions of each blast alone remain to be determined by the judgment of the operator. His mistakes will then be as few as can reasonably be expected. The existence and direction of seams and fissuring are, of course, more or less known to him by what we may call the context of his work; and the only element of guesswork is as to the immediate conditions of the spot where he is shooting. It is a very usual practice in the case of a deep shot—say a 20-foot vertical hole—on a quarry face, to clear or “blow” it by firing a preliminary light charge without tamping. The ostensible use of this is to open a sufficient cavity at the bottom of the hole to accommodate the requisite charge without filling it up vertically, and, incidentally, to disclose any horizontal fissures which may open to the face and so waste the energy of the subsequent shot. I have occasionally seen a hole “blown” in this way two or three times before putting in the main charge. It has its utility, but should be employed with caution, as it may possibly open up a new line of slight resistance, and thus defeat its object. This leads us to consider the main question of general quality just alluded to, and the case of a hole penetrating a perfectly homogeneous rock without seams. In such a case it is probably of very little avail, as the resistance of the unobstructed hole above the blow shot is so much less than that of the surrounding material that it expends its force upward without any clearing effect. On the contrary, as

I have often observed, it may only blow off a little rock immediately above the charge, and jam the hole with it so that it has to be cleared again with the drill.

One may observe again the results on a homogeneous rock by considering the effect in extreme instances. Take for example that of a charge placed in the center of a solid cube of hard glass or quartz in which lines of least resistance are scarcely distinguishable. We should probably get here but one fracture; the cube would split in two. As the other extreme case let us assume a similar cube of pure india rubber. Here again the absence of any lines of varying resistance would bring about the same result. We should expect to get but a single rent in the substance, which would be determined by a very slight variation in its cohesive quality. Thus we may conclude that homogeneity of structure has in fact much more to do with the economic effect of a shot than hardness, and that the real line of least resistance is simply the shortest line between the charge and the exterior of the mass. Thus, in using the judgment necessary for the most favorable location of a shot, a balance must be struck between these two considerations, the allowance to be made for probable irregularities of structure, and that which must be made if it is not irregular. These, as we see, are two different calculations. When a quarryman becomes accustomed to certain general features in a given formation he is apt to lose sight of one or the other.

We also reach the conclusion that in a non-homogeneous rock where natural irregularities of structure afford time for the distribution of the gases and heat from a charge, the slower shot has the advantage; whereas in one of a uniform structure it can make little or no difference how suddenly the explosion operates.

In this connection I have often been led to consider the preference which may be given to a plugged hole in place of ordinary tamping. This arises especially in the case of a homogeneous rock, providing the hole is of any considerable depth. Everybody knows (or ought to know) the facility with which an ordinary shotgun can be burst by merely plugging it at the muzzle, even accidentally, with a little clay or soil. This affords again one of those extreme instances which are often so useful in illustrating a principle. The material is of the toughest, and the obstruction of the lightest quality; yet the bursting effect is assured. The explanation of this may be gathered from the preceding remarks. The explosion of the charge gives time for the fullest expansive effect of the heat and gases generated, but not time enough for the compression of the confined column of air to drive out the stopper. Thus the whole bursting energy is exerted upon the base of the barrel, while the elastic cushion of air is absorbing but a very small fraction of it. The same result may be of course obtained with a rock blast;

but it is necessary to understand when and why it is so. Plugged shots have often failed for want of this appreciation. In the case of the shotgun the conditions are always practically the same, and the best adapted for a bursting effect, inasmuch as the material, the charge, and the length and size of the barrel vary but little. In a rock blast they are not the same, and vary considerably. A bursting effect will not be secured unless the drill hole is fairly free from cavities and fissures, nor unless the column of air in it is long enough to prevent its compression from blowing out the plug. When both of these conditions are right, a plugged shot economizes both in the time occupied in tamping and in the risk if it is performed carelessly. The only requisite is a soft-wood plug turned to a very slight taper, and vertically grooved to admit the passage of the fuse. If a supply of these is kept in hand, a series of holes may be charged and fired in half the time needed for tamping. A couple of blows with a hammer fixes the plug, and the operation is absolutely free from danger. The length of the hole necessary for success in any particular rock can be determined by one or two trials. I have usually employed a plug about six inches long. If dipped in water just before driving, it will swell a little and tighten itself in the hole.

### Petrified Forest of Arizona

The "Petrified Forest" of Arizona, really a series of petrified forests, lies a short distance south of Adamana, on the line of the Santa Fe Railway. There are four "forests," included in a Government reservation called "Petrified Forest National Monument," created by presidential proclamation in 1906. The name "forest" is not strictly appropriate, for the petrified tree-trunks are all prostrate and are broken into sections. The logs are the remains of giant trees that grew in Triassic time, the age of reptiles. The trees were of several kinds, but most of them were related to the Norfolk Island pine, now used for indoor decoration. Doubtless they grew in a nearby region and, after falling, drifted down a watercourse and lodged in some eddy or a sandbank. Later they were buried by sand and clay, finally to a depth of several thousand feet. The conversion to stone was effected by gradual replacement of the woody material by silica in the form called chalcedony, deposited by underground water. A small amount of iron oxides deposited at the same time has given the brilliant and beautiful brown, yellow and red tints which appear in much of the material.

Some of the tree trunks are 6 feet in diameter and more than 100 feet in length. In the first forest there is a fine trunk that forms a natural bridge over a small ravine, the water having first washed away the overlying clay and sand, and then, following a crevice, worked out the channel underneath. The length of this log is 110 feet, and the diameter 4 feet at the butt and 1½ feet at the top.

The petrified woods are beautiful objects for study. When thin slices are carefully ground down to a thickness of 0.003 inch or less and placed under the microscope they show perfectly the original wood structure, all the cells being distinct, though now they are replaced by chalcedony. By studying the sections, F. H. Knowlton, of the United States Geological Survey, Department of the Interior, has found that most of these araucarian trees were of the species *Araucarioxylon arizonicum*, a tree now extinct. It is known to have lived at the same geologic time also in the east-central part of the United States, where the remains of some of its associates have also been found. These included other cone-bearing trees, tree ferns, cycads and gigantic horsetails, which indicate that at that time the rainfall was abundant.

### The Michigan Green Marble

On several occasions during the past twenty years this magazine has spoken of the remarkable deposit of green marble in Northern Michigan. A year or two ago we had pleasure in announcing the organization of the Michigan Verde Antique Marble Company, by the Carter brothers, and the beginning of active operations near Ishpeming. Incidentally it may be stated

#### QUARRY FACE READY FOR BLASTING

A Wisconsin Limestone Quarry in which the entire face is to be thrown down by a monster blast, loaded into well-drill holes

that Mr. Carter first read of this beautiful marble in the columns of *STONE*, and it made such an impression that he kept it in mind until he had an opportunity to make an investigation for himself. The company has developed an excellent quarry, has a good equipment, and has shipped considerable marble.

Now a new producer is about to enter the field. The Marquette Green Marble Company has been formed, with headquarters at Detroit, and quarries and mills at Ishpeming, Mich. Philip McDonough of Columbus, Ohio, a marble man of long experience, is the general manager. One of the first things that will be needed is a spur track from the Chicago & Northwestern

Railway. This will necessitate only about a mile of track and over a very easy grade. It is expected to use electric air channelers, and if it is not found possible to secure a fair rate from the local electric company,

the new concern will build its own power plant. The Michigan deposit is said to be sound and extensive, and every one who has seen samples of the marble can testify to its unusual beauty.

## Notable Building Work in Washington

**A**T the present time work is being pushed on five great buildings in Washington. They are the Lincoln Memorial, the Red Cross Building, the Arlington Memorial Amphitheater, the Interior Department office building and the central power plant that will supply heat, light and power to seventeen executive buildings in the city. They represent a total estimated expenditure of \$8,084,000. So much for the buildings actually under way in the District that have a national character. As for local public buildings, the Central High School building is almost finished, and work will soon be started on the Dunbar High School, while the Eastern High School site is being acquired and this development will commence in a short time. In the District bill, as passed by the Senate, there is an authorization of \$150,000 for the new Gallinger Hospital. In the public buildings act there is an authorization of \$800,000 for a great new District National Guard Armory. Preliminary plans have been drawn by the Supervising Architect of the Treasury for the Bureau of Archives, for which there is a crying need. It is estimated that the cost of erection of such a building will be \$1,500,000. In this same bill there is authorized the donation of sufficient land for the building of a great hall by the George Washington Memorial Society, a project that has been fostered for some years. There is an authorization of \$25,000 for preliminary work of design and engineering for the proposed Lincoln Memorial Bridge to Arlington.

The Freer Art Gallery, that will stand near the Smithsonian Institution, \$1,000,000 for which was donated by the Detroit millionaire of that name, will be an accomplished fact in a few years. Designs have been drawn by Charles H. Platt, of New York, but the contract for erection has not been awarded yet.

A brief survey of the five buildings under way gives some idea of their beauty and importance.

The Lincoln Memorial forms the western terminus of the line drawn through the Capitol and Washington Monument. It has been under way for a little over two years and will be finished one year ahead of contract time. In design an adaptation of the ancient Grecian temples and the resting place of Mausoleus, it is of marble, set upon an artificial eminence, which is formed by setting the apparent foot of the structure some 20 feet above ground and filling in along the lines of a gentle upward slope. It is of light marble, and

some of the blocks, weighing 24 tons, are the largest ever put in an edifice in history. It will be surrounded with groves of shade trees. The cost of this structure is \$2,594,000. The piles, consisting of cylinders filled with reinforced concrete, go down 50 feet to bed rock. Henry Bacon, of New York, drew the plans, and the contract is with the George A. Fuller Company.

The Red Cross Building, south of the Corcoran Gallery of Art, is being put up at a cost of \$750,000, half appropriated by Congress and half by the American Red Cross. It will be ready for occupancy by October. Of the purest white marble, it completes the group of four buildings on the west side of the White House Ellipse, the Bureau of American Republics, the Corcoran Gallery and Memorial Continental Hall being the other three. It is enriched with fluted columns in the Corinthian styles. The structure rests upon piles extending down 30 feet. Trowbridge & Livingston, of New York, are the architects, and the Boyle-Robertson Company has the contract.

The Arlington Amphitheater is progressing rapidly. It will have a seating capacity of 5,000, and will be used on patriotic and memorial occasions. The benches will be all of marble. There will be a chapel at one end, and the building is designed for the emplacement of memorial tablets and statues to distinguish military men of the United States. Danley Vermont marble is used on the exterior, especially selected for its rich color. Carrere & Hastings, New York, drew the plans, and the Fuller Company are the contractors. The cost will be \$750,000.

The Interior Department Building is going up on the square bounded by Eighteenth and Nineteenth and E and F streets northwest. It will have half as much floor space as the Capitol, exclusive of the dome, and house nearly all the bureaus of the department, including the executive offices of the Secretary. Plans were drawn by the Supervising Architect of the Treasury, and the John H. Parker Company, of New York, has the contract. The cost is set at \$2,500,000. The interior construction is of steel frame and concrete, while the exterior is to be done in Indiana limestone.

The central power plant on the Mall at the foot of Thirteen-and-a-half Street southwest has been a subject of much discussion and dissension. Adherents to the l'Infant and fine arts commission plans of development have been loud against its location at this point.



### Hints on Polishing Marble

Smoothing the roughness left on the surface is done by rubbing the marble with a piece of moist sandstone; for mouldings either wooden or iron mullers are used, crushed and wet sandstone or sand, more or less fine, according to the degree of polish required, being thrown under them, says a writer in the *Stone Trades Journal*. The second process is continuous rubbing with a piece of pottery without enamel, which has only been baked once, also wet.

If a brilliant polish is required, Gothland stone instead of pottery is used, and potters' clay or fullers' earth is placed beneath the muller. This operation is performed upon granites and porphyry with emery and a lead muller, the upper part of which is encrusted with the mixture until reduced by friction to clay or impalpable powder. As the polish depends almost entirely upon these two operations, care must be taken that they are performed with a regular and steady movement.

When the marble has received the first polish, the flaws, cavities and soft spots are sought out and filled with mastic of a suitable color. This mastic is usually composed of a mixture of yellow wax, resin and burgundy pitch, mixed with a little sulphur and plaster passed through a fine sieve, which gives it the consistency of a thick paste. To color this paste to a tone analogous to the ground tints or natural cement of the material upon which it is placed, lampblack and rouge, with a little of the prevailing color of the material, are added.

For green and red marbles, this mastic is sometimes made of gum lac, mixed with Spanish sealing-wax of the color of marble. It is applied with pincers, and these parts are polished with the rest. Sometimes crushed fragments of the marble worked are introduced into the cement, but for fine marbles the same colors are employed which are used in painting, and which will produce the same tone as the ground; the gum lac is added to give it body and brilliancy.

The third operation in polishing consists in rubbing again with a hard pumicestone, under which water is being constantly poured, unmixd with sand. For the fourth process, called "softening the ground," lead filings are mixed with the emery mud produced by the polishing of mirrors, or the working of precious

stones, and the marble is rubbed by a compact linen cushion well saturated with this mixture; rouge is also used for this polish. For some outside works, and for hearth and paving tiles, marble workers confine themselves to this polish. When the marbles have holes or grains a lead muller is substituted for the linen cushion. In order to give a perfect brilliancy to the polish, the glass is applied. Well wash the prepared surfaces and leave them until perfectly dry; then take a linen cushion, moistened only with water, and a little powder of calcined tin of the first quality. After rubbing with this for some time, take another cushion of dry rags, rub with it lightly, brush away any foreign substance which might scratch the marble and a perfect polish will be obtained. A little alum mixed with the water used penetrates the pores of the marble and gives it a speedier polish. This polish spots very easily, and is soon tarnished and destroyed by dampness.

It is necessary, when purchasing articles of polished marble, to subject them to the test of water. If there is too much alum, the marble absorbs the water and a whitish spot is left.

### Quarry Trouble in Court

In behalf of all of the stockholders of the Barre Granite & Quarry Co., Frank M. Corry, trustee, and Charles J. Nye have entered proceedings in Vermont courts against the Barre Granite & Quarry Co. and Donald Smith, A. A. Smith, D. A. Perry and S. Hol-

### IMITATION STONE DOES NOT LAST

Terra cotta work in an expensive residence at Bernardsville, N. J., erected only a few years ago that has already fallen to pieces and must be replaced

lister Jackson of Barre and H. Nelson Jackson of Burlington. Mr. Corry asserts that he owns stock in the company valued at \$1,050 and that he stands ready if the property is put up at public auction to open the bidding at \$125,000.



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CONSULAR reports show that all branches of the stone trade abroad have been badly affected by the war. Exports to the United States have fallen off, although they are now beginning to show a slight recovery. Consul Dumont reports that the exports of alabaster from the consular district of Florence for the first six months of 1914 amounted to \$38,140. During the same period in 1915, they were only \$26,407, while in the first half of 1916 they were \$31,514. A similar condition of affairs is shown as to the exports of worked marble to the United States. The value for the first six months of 1914 was \$72,082, for the same period in 1915, \$35,769, and for 1916, \$43,518.

ACCORDING to data compiled from various sources by the United States Bureau of Labor Statistics, the number of strikes and lockouts during the six months from January to June, inclusive, was 1,719, showing an increase of 1,232 over the number similarly compiled during the first six months of 1915. However, the number of strikes during the month of June shows a marked decrease from that during the three preceding months. Nearly all of the 201 strikes occurring during the month of June were of a purely local character. Among the June strikes the largest proportion were in the metal and building trades and mining. Quarrying and stone-working ranked tenth, with ten strikes and no lock-outs. In view of all the talk of general prosperity and enormous profits following the war, it is only natural that the laboring classes should seek to get their share of the good things. But before they undertake a strike to enforce new demands, they should be very certain that the trade to which they belong is having a fair share of the general prosperity. The stone industry is one of the last that reacts to active business conditions, and a general advance in

wages at this time would do much to cripple the production and working of stone.

POOR Boston nearly always has some problem on its hands that stirs its Puritan conscience or New England thrift to its depths. Now it is fretting over the proper disposition that can be made of the stately and historic marble pillars that formerly adorned the custom house. When that building was remodelled, these columns were removed. They were presented to the city and were temporarily set up in Franklin Park. The mayor saw them, and they appealed strongly to his æsthetic tastes. He stirred up the Art Commission to find out if some suitable and permanent use could not be made of them. The Art Commission reported that it favored postponement of action until such time as a marble building could be erected, artistically suited to the pillars. When Mayor Curley casually asked the cost of such a building he was informed that it would be only two or three million dollars. Now he wants to sell the pillars or give them away before the artistic residents of the Hub are tempted to swamp the city treasury.

AN important Federal building is to be erected in a Western city and there is a bitter controversy as to the material of construction. Aside from standard stones of the East, which have been figured by the contractors, quarries in several near-by States are hot after the job, and the claims of each one are loyally, if not judiciously, upheld by the press of its State. We have intimated that much of this support is not well-considered, and the reason for it is not far to seek. If those who, working on behalf of their favorite stone, should confine themselves to emphatic statements of its superlative merits, all would be well. They might dilate at any length and in as extravagant language as they chose on the cheapness, beauty, durability and strength of the stone, and then they will have done all that can be expected of them. But the newspapers and the local commercial bodies, whose opinions they voice, have gone much further than this. They have attacked, not only the Eastern stones, which are standard and have been so long established that they can ignore such silly onslaughts, but even the competing Western stones. Furthermore, they keep harping on the fact that the freight rates on the Eastern stones are many times greater than those from neighboring States, childishly overlooking the fact that the only thing that counts is the cost of the finished stone in the building. Hints about sinister influences being at work are also out of place. The material for government buildings is almost invariably chosen because of price and suitability to design, and the politicians cut a far less figure than is supposed, although they may be very willing to have their constituents think that they are potent. The entire stone trade must deeply regret these unseemly controversies. Not only are they

futile, but they give to the makers of artificial stone and concrete their best chance.

THE recent fall of a tenement building in the Bronx, New York, during the process of construction, whereby two men were killed and sixteen injured, has led to a searching investigation by the coroner. The testimony brought out at the various hearings was surprising. One of the partners in the contracting firm that had in charge the erecting of the building said he had had ten years' experience as a bricklayer, but practically none as a contractor. He admitted an entire lack of knowledge of the Building Code and knew of no standard formula for the mixing of mortar. The architect testified that his plans had been altered by the contractors in several important points. A bricklayer employed on the job said that the average rate of construction of the building had been a story every six hours, and that one of the owners came around nearly every day and "looked pleased at the way the house was jumping skyward." One of the city inspectors testified that there was no regulation of the Building Department which directed builders to wait until the arrival of the inspector. He intimated that dishonest contractors could cover up shoddy work before he arrived, and that when he got there everything would look all right. This is certainly an astonishing condition of affairs, and the public should insist that some adequate remedy be found. There is altogether too general a use of cheap and dangerous materials and too great speed of construction. It is time for Americans to boast a little less of their enterprise and smartness, and to cultivate thoroughness and honesty.

### Colorado-Yule Reorganization

Plans are on foot for the reorganization of the Colorado-Yule Marble Company and the termination of the receivership. The Reorganization Committee is composed of Mortimer Mathews, Norton M. Little and A. J. Mitchell, large holders of the securities of the company.

Owners of the stock and bonds of the company are asked to deposit them with the Colorado National Bank on or before September 10. The committee states that its plan is intended to safeguard, as far as possible, the present security holders and provides for raising money to enable the company to operate when it emerges from the receivership.

The committee has power under the plan to purchase the assets and business of the company at foreclosure sale and to arrange for their acquisition by a new company, which will issue mortgage bonds and preferred and common stock as contemplated by the reorganization plan, or by the transfer of the deposited stock to a new company in exchange for the preferred and common stock of the new company or by a com-

bination of two or more methods. Security holders are to be given receipts, and if the majority of them do not approve of it their securities will be returned.

Holders of existing underlying bonds can exchange their bonds, par for par, for a like amount of ten-year bonds, or may receive at their option the par value of their bonds, plus accrued interest, in cash. Holders of first refunding bonds will receive for every \$1,000 par value the following: New 5 per cent general mortgage bonds, par value \$250; new 6 per cent cumulative preferred stock, par value \$500; new common stock, par value \$250.

Holders of second refunding bonds will receive for every \$1,000 par value 5 per cent. general bonds, par value \$250; 6 per cent. cumulative preferred stock, par value \$500, and common stock, par value \$250.

Subscribers for first and second refunding bonds and for the \$80,000 loan, who have as yet received no securities, and holders of the debentures will receive for every \$1,000 par value thereof the new securities in the same manner and proportion.

Holders of existing first preferred stock will receive for every \$1,000 par value thereof in the new common stock, par value \$100, or at said rate. Holders of existing second preferred stock will receive for every \$1,000 par value thereof in the new common stock, par value \$75, or at said rate. Holders of existing common stock will receive for every \$1,000 par value thereof in the new common stock, par value \$50, or at said rate. Holders of past-due coupons from first and second refunding bonds, or those who are entitled to receive interest which is past due from debentures, or refunding notes, and those who are entitled to receive interest on subscriptions for first and second refunding bonds and the \$80,000 loan, which securities have not been issued, are to receive for every \$100 par value of such delinquent interest, in the new common stock, par value \$15, or at said rate.

The proposed new capitalization is as follows:

Bonds and capital stock to be outstanding upon consummation of plan:	
6 per cent. first mortgage gold bonds (authorized and outstanding).....	\$1,000,000
5 per cent. general mortgage gold bonds authorized \$1,000,000; outstanding.....	721,475
6 per cent. cumulative preferred stock (preferred both as to dividends and assets; cumulative after Jan. 1, 1917)....	1,000,000
Common stock (authorized and outstanding) .....	1,500,000

### Will Use Vermont Granite

Colonel Taylor, Major Bell and Captain Mintz of the U. S. Engineering Department at Albany, N. Y., have held a conference with the Vermont Macdonough Memorial Commission at Vergennes and approved of the location in the park selected by the commission for

the placing of the memorial monument commemorating the building of the fleet at Vergennes by Commodore Macdonough in 1812-14. Col. Taylor said that the contract for the building of the monument would be given soon and that if possible, at the suggestion of the commission, Vermont granite would be used instead of Maine granite, as at first contemplated.

### Business Brevities

The city of Richmond, Va., wishes to build a bridge across the James River, which would pass over Belle Isle. In payment for the privilege of laying its tracks over the bridge and rerouting certain of its line, the Virginia Railway & Power Company offers to allow the city to take from its quarries on Belle Isle, without charge, all the stone needed for the construction of the bridge and approaches.

The stone front of the old St. Louis Hotel, in New Orleans, has been purchased by the Louisiana Railway & Navigation Company to use in the construction of its new passenger station on Rampart Street in that city. Part of the stone work consists of massive fluted columns that will be used for the embellishment of the new station.

Through the action of the boards of freeholders of Camden and Atlantic counties, New Jersey, a stone road from Philadelphia to Atlantic City is assured. Already there are a number of miles of paved roadway between the two cities, from the Delaware River to Berlin, N. J., and from Atlanta City to Absecon; and now the intervening distance will be paved. The new hard surface will be either eighteen or twenty feet wide.

To honor the memory of Major General Julius Stahle, a soldier in the Civil War and a friend of Kossuth, the Hungarian patriot, citizens of Hungarian birth organized the General Stahle Monument Association in New York. A nation-wide canvass for funds to erect a monument at a cost of \$150,000, half of which is to be appropriated by Congress, is planned. The monument, of bronze and marble, will be placed in a park in Washington. The sculptor must be a United States citizen. General Stahle, who died two years ago, came to America with Kossuth. In the Civil War he commanded the defenses of Washington and was American Consul-General to China for many years.

Work is approaching completion on the new post-office and courthouse at McCook, Neb. The building will be faced with stone. Its cost, including the site, is \$125,000.

Contracts have been awarded for more than \$500,000 worth of street improvements for the Borough of Queens, New York.

The Anderson Monumental Works, of Ionia, Mich., have been sold to Ernest E. Swanson, of Detroit. Mr. H. Anderson, the former proprietor, was forced to retire by ill-health.

An injunction was brought by property owners to prevent the Minneapolis Street Railway Company from building a stone wall along its tracks near Lake Harriet, Minn. A compromise has been reached and the construction of the wall has been resumed.

According to a report made by the Chamber of Commerce, the output of stone and marble in Los Angeles has more than doubled in five years.

The Pike's Peak Highway has been completed and was recently used for automobile races. The entire eighteen miles of the road, which, in places, is three miles above sea level, is coated with disintegrated granite taken from the mountain side. Fourteen miles up the grade there is a parking space for 7,000 automobiles.

Nebraska enters a protest, through George F. Johnson, state engineer, against any standard of road-making being

adopted which Nebraska cannot meet. Intimations have come that eastern states, in advocating regulations governing the distribution of federal aid in highway building, insist on a standard, probably stone or brick, that will make it almost impossible for such states as Nebraska to meet. This state, it is said, has abundant good roads material in the way of gravel and clay, but could not well adopt such a standard as stone or brick.

Oil City, Pa., has formed a permanent organization which will work for the erection of a \$10,000 soldiers' monument in Grove Hill Cemetery.

A proposal to erect a monument to Col. John S. Mosby, the noted Confederate commander, who recently died in Washington, has been taken up by the few surviving members of his troop and Confederate veterans in general. It will probably be erected in Warrenton, Va., where Col. Mosby is buried.

Idaho is proposing to use crushed lava to surface its highways where that rock abounds.

Mayor Mitchel of New York has vetoed a proposed ordinance requiring that stone for city work, except paving blocks and crushed stone, be dressed or cut within the city limits. The Mayor said it had been brought to his attention that such an ordinance would violate the interstate commerce clause of the Federal Constitution. He also said that a ten per cent. increase in the cost of public building would result if all the work were done here.

The United States Senate has passed a joint resolution authorizing the erection in Arlington Cemetery, Washington, of a monument to the various orders of Sisters who served as nurses in the Civil War. The Ladies' Auxiliary, A. O. H., is to erect the memorial, which will be placed in the burial grounds at no expense to the Government.

The fourth annual convention of the Central District Mantel and Tile Contractors' Association was held at the Hotel Seelback, Louisville, Ky., the past month. Delegates from most of the Central States were present. The convention was called to order by Charles L. Shannon, of Cincinnati. After the meetings were over, the members paid a visit to Mammoth Cave.

### New Companies

The Bloomington Stone and Construction Company, of Bloomington, Ind., to quarry and cut stone, etc. Capital, \$20,000. Directors: A. K. Hilton, W. C. Stuart, Fred L. Owens.

The National Tile and Marble Company, of Cleveland, Ohio, to manufacture and deal in marble, tile, etc. Capital, \$10,000. Incorporators: E. S. Byers, Carl D. Friebohn, Ada E. Gillard, Edward W. Disette, Harry H. Rose.

Peterson Quarry Company, of Rapid City, South Dakota, to quarry and deal in stone. Incorporators: Tom Sweeney, Ole Peterson and Albert S. Halley.

United Granite Company, of Columbia, S. C., to do a general granite polishing and cutting business. Capital, \$2,000. Incorporators: C. T. Graydon, G. P. Logan and Seberino Aja.

Glen Oak Quarry Company, of Glendale, St. Louis County, Mo., to do a general quarrying business. Capital, \$2,000. Incorporators: J. S. Watson, De Roo Weber and George B. Logan.

Paul Mottis Company, of Wendell, N. C., to conduct a quarrying business. Capital, \$10,000. Incorporators: Charles Paul, of Newsom; H. C. Morris, of Wendell, and T. H. Mecum, of Walkerton.

The America Green Granite Company, Inc., of Barre, Vt., to do a retail granite business. Capital, \$5,000. Incorporators: Waldon Shield and Earle R. Davis, of Barre, and Simeon Garrard, of Montpelier.

## Working Out Egg-and-Tongue Mouldings

THE Romans formed their mouldings from parts of the circle, while the Greeks preferred the ellipse or other conic section. The echinus, or egg-and-tongue moulding, was used for ornamenting the moulding called the ovolo, or quarter round, though, as a matter of fact, it was not by any means always a quadrant of a circle, says a writer in *Building World*, of London.

Fig. 1 shows how the quarter-circle is formed. The form shown in Fig. 2 is also called an ovolo, but, as the centre A shows, the segment of the circle is less than one-fourth. Supposing that from B to C is the width of the moulding, take B as centre and C as radius, and describe an arc. With C as centre, and with the same radius, cut this arc, and the centre of the required profile will be discovered.

There are several ways by which the Greek ovolo may be described. Fig. 3 shows one way. Draw the two parallel lines for the width of the moulding. Supposing A to be one extremity of the moulding and B the other, draw the dotted lines A C, B C, and from B raise a perpendicular of indefinite length parallel to A C. Make A D two-thirds of A C, and join D B. From A draw A E parallel to D B, and make E F equal to E B. Divide the lines A E and A D into four equal parts, as 1 2 3, 1' 2' 3', and from 1 2 3 draw lines to B, and from F through 1' 2' 3' draw lines to intersect those already drawn.

The intersections will give points in the curve, which must now be drawn freehand. It will be noticed that the parallelogram C B x Y is almost a square; consequently, if the distance from x to Y is increased or lessened, the contour of the moulding will be altered; and if A D is made half or one-third of A C, the contour will again be made flatter or rounder as the case may be.

Now as to the setting out of the egg-and-tongue enrichment. Fig. 4 shows a front view of the egg-and-tongue taken from the Erechtheum at Athens, from which building most varieties have been derived. Figs. 5 and 6 are of Roman origin, the former being from the Pantheon, and the latter

from Trajan's Column. In each case a section is given showing the different profiles of the moulding.

Of the other two examples, Fig. 7 is Renaissance, and Fig. 8 modern. The last-mentioned example shows how the surface of the leaves is covered with independent ornament in complete defiance of the original Greek.

From all this it will be seen that it would be a difficult matter to give any hard-and-fast rules as to how to set out the egg-and-tongue; but it may be taken for granted that the enrichment should be cut out of the solid moulding, and not applied to the surface, as by the latter method there is danger of destroying the contour of the moulding. Of course, this is an understood thing in carving; but if the work is done in plaster there is no necessity for every repeat of the ornament to be cut out.

A bed for the enrichment might first of all be run, as shown by Fig. 9, and on this bed the profile of the moulding may be run in clay, using a wood or zinc template, as shown in section at A. One repeat, as at B, may then be modelled, or rather carved out of the clay, and a mould made of this part. By pressing clay into this mould, any number of copies may be reproduced and placed side by side.

With reference to the design for enriched moulding (Fig. 10), let it be assumed that the moulding is a cavetto—the exact reverse of the ovolo. The shape of the moulding is first run, and the ornament applied. Set out the extreme length of the repeat, as x y (Fig. 10), and begin by building up the central feature A. Then lay down the outer rolls B B, and fill up the space between them and the centre.

For the outside leaves, with ball in the middle, it is better, instead of modelling the two halves, as shown between x y, to model one complete leaf, cut it in two, and place each half as shown on the drawing. In many cases it is almost impossible to give detailed instructions for modelling any particular piece of ornament. In free ornament there is no set method; it is simply a question for the individual modeller to decide for himself.

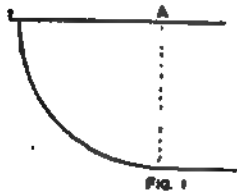


FIG. 1

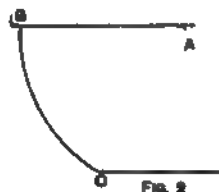


FIG. 2

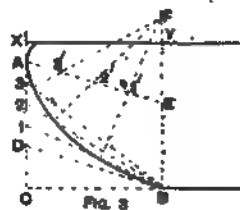


FIG. 3



FIG. 4



FIG. 7



FIG. 8



FIG. 9

FIG. 9

FIG. 10

### MARKING OUT EGG-AND-TONGUE MOULDINGS

Figs. 1 and 2—Roman Ovolo. Fig. 3—Greek Ovolo. Fig. 4—Greek Egg-and-tongue from the Erechtheum. Figs. 5 and 6—Roman Egg-and-tongue. Fig. 7—Renaissance Egg-and-dart. Fig. 8—Modern Egg-and-dart. Fig. 9—Bed Prepared for Running Ovolo Moulding. Fig. 10—Enriched Cavetto Moulding.

## Notes from the Stone Fields

### MARBLE AND GRANITE.

Monument men in all parts of the country declare it is almost impossible to get any Scotch granite at present, and they do not expect to get any for several years after the war ends, because vessels will be used for more important shipments.

The Crooks & McLean Marble & Granite Company has greatly increased the equipment in its plant at Carthage, N. Y. There are new electrically driven air compressors, polishing machines and conveyors. The company operates branches at Gouverneur, Boonville, Watertown, Cape Vincent, Norwood and Ogdensburg, N. Y.

The Capitol Hill Monument Company of Des Moines, Ia., will increase its force by twenty-five men and will add a de-

erected in Mt. Olivet Cemetery, Denver, by the members of the McPhee family to Charles D. McPhee and John J. McGinnity. These two men were lifelong friends and partners in a great lumber business. The plot, where other members of the family will lie after death, is laid out in the shape of a cross, with crypts sunken in the earth, guarded with heavy slabs of white marble. In the center of the cross is a simple, heavy monument of marble, against which a figure of "Meditation," cast in bronze, stands out in lifelike relief. The work was done by a Bohemian sculptor, J. Marion Korbel, who was forced by the war to leave his studio in Paris. All of the marble used was from the Colorado-Yule quarries, and the stone contractor was Peter F. Bossle, of Denver.

Louis Kamper, a Detroit architect, has just paid a visit of inspection to the Vermont marble quarries.

The Eagle Marble & Lime Company, of Stockton, Cal., is endeavoring to secure subscriptions for stock for the purpose of installing lime kilns and machinery for quarrying marble on a property of 60 acres in Calaveras County, Cal. The company is required to complete its financing arrangements by February 1, 1917.

Bishop W. A. Candler, Chairman of the General Conference Committee of the Methodist Episcopal Church, South, and Dr. George S. Sexton, Secretary, have closed a contract for the erection of a beautiful church in Washington, designed to be the gift of Southern Methodists to the nation's capital. It will be constructed of Georgia marble on a site at Massachusetts Avenue and K Street, facing Mount Vernon Place Square. Construction is to begin immediately. The church will cost \$250,000. The erection of a national church here by the Methodists of the South was authorized by the general conference of that body, held last winter. The project was hailed with great enthusiasm, and the taking of such a step was regarded as putting the seal on the unspoken disinclination to enter into any arrangement looking to the adoption of measures that would bring Northern and Southern Methodists into a single body.

The Mariner & Tupy Company, Inc., of Sioux City, Ia., the principal owners of which are F. C. Mariner and J. L. Tupy, are erecting a large and elaborately equipped marble plant at Fourth and Pavia streets, in that city. It will be two stories high, 80x100 feet. There will be two gang saws.

Mrs. Mary E. Marony, of Deer Lodge, Mont., has made a gift to the Society of Montana of an 18-foot shaft of New Hampshire granite which will be erected at Gold Creek near the spot where gold was first discovered in Montana.

The Wise Granite Construction Company, with offices in Savannah, Ga., has just been awarded the contract for the erection of a Public Auditorium in that city, on its bid of \$112,000. The plans for the building are by Henrik Wallin and Arthur F. Comer, of Savannah.

The granite quarries in Websterville, Vt., formerly operated by the Capitol Granite Company, have been reopened. The company's head office will be in Batavia, N. Y., and William E. Lappin will be the manager at the quarries.

W. R. Courtney of Wadesboro, N. C., has purchased the marble works at Florence, S. C., formerly owned by J. W. Chapman. Mr. Courtney will equip the plant with pneumatic machinery.

The Middlebury Marble Company has reopened the quarry at Brandon, formerly operated by the Meadowbrook Marble Company. The quarry has been idle for the past twenty-eight years. It will be operated with electric power supplied by the Horton Power Company.

A bill for a \$100,000 memorial to John Ericsson, inventor of the Monitor, has been introduced in Congress, and Swedish-American societies are urging its passage. It developed in the House Library Committee's hearings that the United States owes Ericsson, or his heirs, an acknowledged debt, the

### A HOME-MADE COPING MACHINE

Constructed by a Western marble worker at a cost of \$700, exclusive of the 40 hp. motor. Will turn out thirty 6-ft. partition slabs per day of eight hours, with one man and a helper.

partment for interior marble work. The company is completing a new plant at East Seventh and Raccoon streets. P. B. Sheriff is president of the company.

The quarrymen at Berlin, Wis., have been on a strike, but at the date of writing a satisfactory settlement was expected.

It is expected that the new Missouri State Capitol at Jefferson City will be completed in May or June next. The exterior stone work is now practically completed. The building and grounds will cost \$3,600,000.

The Federal Granite Company is contemplating the removal of its finishing plant from Salida, Colo., to Denver. David Heaton, the president of the company, says that his concern owns 80 acres of granite-producing land eight miles from Salida, and that this is shipped all over the country. If Denver is used as headquarters the granite will be shipped in the rough from the quarries and finished in the latter city. One reason that impels the company to make the move is that the business is growing rapidly and there are not adequate housing facilities for the men at the quarries.

A handsome memorial to the late Harry C. Printz has been erected in Blandon Cemetery, Reading, Pa., by the Epp Granite Company of that city. It was designed by the widow of Mr. Printz, and has a novel and beautiful feature. There is a stained glass inset in the central die, with a representation of "Christ in Gethsemane" and bearing the chief inscription. The monument is situated in one of the most commanding spots in the cemetery. It is placed so that the morning sun shines through the glass insert when it rises and catches the light of the setting sun at evening.

The city of Indianapolis will pave Delaware Street with granite Durax blocks.

A memorial of unusual beauty and simplicity has been

interest on which, if compounded at four per cent, would exceed the sum about to be appropriated for his memorial. Efforts to collect this money have been discontinued as useless, however.

V. S. Amussen, of Logan, Utah, has brought suit against R. O. Hansen and J. H. Brown, of the same place. Amussen alleges in his complaint that he subscribed and paid for 2,000 shares of the stock of the Logan Monument & Stone Company, paying one dollar per share, but that the defendants, as officers of the company, have refused to issue the stock to him.

#### LIMESTONE AND SANDSTONE

The Cleveland Stone Company and the Ohio Quarries Company report a big increase in business at the quarries in Amherst this year. There are orders on hand to keep the large quarries working for several months.

Negotiations are in progress looking toward a settlement of the differences existing between the stockholders of the National Limestone Company, which formerly operated immense plants in Berkeley County, W. Va. It is believed that a reorganization can be perfected. The men conducting the negotiations were W. W. Jackson, of Williamsport, Pa., Chairman of the Minority Stockholders' Committee; Clarence L. Peaslee, also of Williamsport, Chairman of the Majority Committee, and U. M. Fels, of Tonowanda, Pa., a member of the latter Committee. Another gentleman interested in the negotiations was H. S. VanDeusen, of Scranton, Pa.

The contract for the erection of the new post-office at Portland, Ore., has been awarded to Grant S. Fee, of San Francisco. The producers of Boise sandstone are making every effort to have the building erected of that stone.

It is expected that the new state lime-crushing plant at Okona, Chickasaw County, Miss., will be in operation in a short time. The work will be done by convict labor. Arrangements are to be made to equip a similar plant at Waynesboro.

The farmers of Benton, Linn and Lincoln Counties, Ore., are endeavoring to have a lime-crushing plant established in that state, to be operated by convict labor.

The contract for the erection of the first building for Gooding College, at Gooding, Idaho, has been awarded to W. M. Clifton, of Boise. The plans at present call for the erection of the entire building in Boise sandstone.

The completion of the arrangements for the building of the West Point-Urbanna Railroad in Virginia has led to an agitation for the erection of the proposed lime-crushing plant to supply Tidewater, Virginia, at Urbanna.

#### SLATE.

The Southern Slate Company of Wildham, Tenn., with general offices in Columbus, Ohio, owns some five thousand acres of slate and marble land on the Little Tennessee River, in Blount County, Tenn. Although the company has operated the quarries to some extent for the last fifteen years, they were twenty miles from a railroad, which was naturally a great handicap. Now a railroad switch has been run to the property. The company has built some houses and has a general store. It is the idea of the company to turn the quarrying end over to competent people and content itself with buying and marketing the product.

Production of slate is being resumed at the Eureka slate quarry at Slatington, northwest of Placerville, El Dorado County, Cal. After an idleness of several years there was a small output in 1915. The property has been taken over by the Sierra Slate Corporation of New York, and will be operated on a large scale. The company expects to prepare for market from 1,000 to 3,000 squares per month.

#### Quarry Notes

The city of Dallas, Ore., has purchased a rock quarry at Falls City, Ore. The stone will be shipped to Dallas, where it will be crushed. It is said to be one of the best stones in the state for highway construction.

The new Charleston-Savannah link of the Seaboard Air Line is being completed. This crosses the Ashley, Stono and Edisto rivers. The road is being ballasted throughout with crushed granite.

The city of Minneapolis has appropriated \$25,000 for the purchase of a municipal quarry. The city engineer says he can purchase a quarry in which there are 400,000 yards of stone for \$20,000.

Kings County, Cal., recently purchased a 40-acre quarry in

#### A CROSS-CUT MACHINE

Made by a Western marble worker at a total cost of \$50.  
Will do much and accurate work in the hands  
of a careful man

Tulare County. It is said that this contains a valuable deposit of magnesite.

Six men were killed by an explosion at the Columbia County Quarry, near St. Helens, Ore. It is believed that the explosive, which was being placed in a tunnel, was fired by a flashlight.

A peculiar phenomenon in a quarry at Byron, Ill., is the issuing of a blast of cold air from a crevice in the rocks. Workmen place pails of water near it and in a short time the water is as cold as if chilled with ice.

#### Monument Men Meet at Cleveland

The eleventh annual convention of the National Retail Monument Dealers' Association was called to order in the Hollenden Hotel at Cleveland on August 15. It was the most largely attended and successful gathering in the history of the

association. Edwin A. Butt, president of the Cleveland association, welcomed the convention to the city, and Judge White of Cleveland made an address of greeting. There was also an address by H. C. Hefner of Denver, a member of the Executive Committee, to whose untiring efforts much of the success of the meeting was due. President C. B. Holden read the annual message, reviewing the progress made during the past year. The following officers were unanimously elected:

President, J. H. Marsteller, Roanoke, Va.; vice-president,

the post office at Newark, Ohio, to T. W. Cissel, Wooster, Ohio, at \$103,400.

The government has rejected the bids received August 11 for the construction of the post office at Burlington, N. C.

### Construction Notes

Ground has been broken for a \$250,000 apartment house that Harry Wardman will erect at Seventeenth Street at Riggs Place N. W., Washington. The architects are A. M. Schneider & Company, of that city. The building will have limestone trim, and the interior finish will be marble.

The A. S. Gilman Company will erect a monumental printing building at Lakeside Avenue and West Third Street, Cleveland, at a cost of \$100,000. The plans are by the Forest City Engineering Company, of that city. The front will be of granite and terra cotta.

Wyman, Partridge & Co. are erecting a 12-story business building on Fifth Street, between First and Second Avenues, N. Minneapolis. The basement will be of polished Minnesota granite.

Trustee of Columbia College will erect a five-story store and loft building at 27 West Forty-ninth Street, New York. The architect is Adolph Mertin, 34 West Twenty-eighth Street, New York. It will be of limestone and brick construction.

Gaetano Ajello, architect, 1 West Thirty-fourth Street, New York, is preparing plans for a 13-story limestone and brick apartment house at Broadway and 105th Street, this city, for T. J. McLaughlin & Sons. The structure will cost about \$400,000.

Goldingay Brothers will erect one of the largest apartment houses in Newark, N. J., at Orchard and Tichenor Streets. It will be five stories in height with limestone trim and entrance of marble.

Architect W. T. McCarthy, 16 Court Street, Brooklyn, has drawn plans for a \$200,000 apartment house in that city on Livingston Street, adjacent to Packer Institute. It will be six stories in height, and the reception hall will be finished in Caen stone and marble.

Sedgwick County, Kansas, will erect a \$100,000 jail at Wichita, adjoining the court house. The architect has not yet been chosen.

N. Serracino, architect, of 1170 Broadway, New York, has completed plans for the new St. Sebastian's Church, to be erected at 312-316 East Twenty-fourth Street, this city. The church will be in the gothic style, with a seating capacity of 650. The exterior will be of stone, brick and terra cotta.

The Kanawha Banking and Trust Company, of Charleston, W. Va., will erect a nine-story banking and office building in that city, costing about \$200,000. The architects are Dennison, Hiron & Darbyshire, 475 Fifth Avenue, New York. Bids will be received about December 1.

The First National Bank, of Kalamazoo, Mich., will erect a three-story bank and office building in that city, costing about \$165,000. The architect is Oscar Wenderoth, 1907 South Michigan Avenue, Chicago.

The general contract for the erection of the \$1,500,000 Terminal Hotel in Cleveland has been awarded to Crowell, Lundoff, Little Company, 1951 East Fifty-seventh Street, that city. The architects are George B. Post & Son, 101 Park Avenue, New York.

Architect O. A. Thayer, 89 Franklin Street, Boston, is preparing plans for a \$125,000 building for the Bunker Hill Boys' Club, of Charlestown, Mass.

Messrs. Cram & Ferguson, of Boston, have prepared plans for a \$200,000 church and parish house for the Mt. Calvary Church, Baltimore, Md.

Elzner & Anderson, Ingall Building, Cincinnati, and Louis

### OLD ENGLISH MANOR HOUSE OF STONE

A striking structure erected of sandstone. From a sketch in the London *Architect*

George M. Lennon, Joliet, Ill.; secretary, Frank Mallon, Port Huron, Mich.; treasurer, Theodore F. Gaebler, Rockville, Ind. Board of managers (three-year term), George H. Gelts, Munice, Ind., and Stanley J. Sullivan, Philadelphia. H. P. Rieger of Baltimore, was selected to fill unexpired term of H. J. Sisson.

Prizes for monumental designs were awarded as follows:

Class A—First, J. C. Ayers, Mansfield, Ohio; second, Walter Craig, Cleveland.

Class B—First, J. C. Ayers, Mansfield, Ohio; second, Walter Craig, Cleveland.

Class C—First, J. C. Ayers, Mansfield, Ohio; second, Fred Haslan, Paola, Kans.

In connection with the convention there was one of the finest displays of monumental work and statuary ever seen in this country.

The social features of the gathering were very pleasant, and included a visit to the Lake View Cemetery

### Obituary Note

W. F. Benedict, for many years a granite and marble dealer of Middletown, N. Y., died at that place the past month. Mr. Benedict was 74 years of age.

### Government Work

Bids will be received at the Supervising Architect's Office, Treasury Department, Washington, D. C., for the construction of the following post offices: Until October 5, at Berlin, N. H.; October 6, at Skowhegan, Me.; October 12, at Buckhannon, W. Va.; October 16, at Dickinson, N. D.

The contract for the erection of the post office at Rumford, Me., has been awarded to the Newport Contracting and Engineering Company, of Newport News, Va., at \$53,700, and for



E. Jallade, 57 Liberty Street, New York, have prepared plans for a Y. M. C. A. building in Cincinnati. It will be nine stories high and cost about \$350,000.

Messrs. Beuttler & Arnold, Security Building, Sioux City, Iowa, have been selected as architects to prepare plans for a \$150,000 Masonic temple and office building in that city.

Preble County, Ohio, will erect a \$250,000 court house at Eaton, after plans by H. H. Heistand, of that place, and Richards, McCarthy & Bulford, Hartman Building, Columbus, Ohio.

The Baptist Women's Missionary Training School, of Louisville, Ky., will erect a \$150,000 building, after plans by Brinton B. Davis, Louisville.

Messrs. Tyrie & Chapman, Auditorium Building, Minneapolis, have prepared preliminary sketches for a \$175,000 high school building at Aurora, Minn. Work will not begin until spring.

M. B. Cleveland, architect, of Waterloo, Iowa, has completed plans for a \$300,000 high school at that place.

William B. Ittner, Board of Education Building, St. Louis, Mo., has prepared plans for a \$350,000 high school building at Port Arthur, Tex.

The Redemptorist Fathers will build a parochial school, chapel and convent at Saratoga, N. Y., costing about \$300,000. The architect is George P. Gunther, Saratoga.

The St. Paul Mausoleum Company will erect a \$350,000 community mausoleum in that city. Architects Beuchner & Orth, Shubert Building, St. Paul, Minn.

The General Hospital, of Lawrence, Mass., is planning the erection of a \$125,000 hospital building.

The Christian Union, of Bridgeport, Conn., will erect a four-story building after plans by Briggs & Caldwell, architects of that city.

An addition, costing \$156,000, will be made to the South Tenth Street School, Newark, N. J.

Newton, N. J., will erect a high school costing about \$75,000, after plans by Rasmussen & Wayland, 1133 Broadway, New York.

The Quakertown, Pa., Trust Company will erect a banking building after plans by W. C. Furber, of that place.

The Atlantic Coast Line Railway will build a passenger terminal at Norfolk, Va.

Petersburg, Va., is planning the erection of a convention hall and armory.

C. M. Robinson, Richmond, is preparing plans for a \$100,000 high school at Portsmouth, Va.

Columbus, Ohio, is considering the erection of an Exposition Hall to cost about \$300,000.

Wilberforce University, of Wilberforce, Ohio, will receive bids until September 21 for the erection of a gymnasium. The plans are by F. L. Packard, Columbus, Ohio.

The Buick Motor Company will erect a \$250,000 office building at Flint, Mich.

Holabird & Roche, 104 South Michigan Avenue, Chicago, are preparing plans for a 21-story building on La Salle Street, costing about \$3,500,000, for the Board of Trade.

J. E. Stitt, Norfolk, Neb., has prepared plans for a Masonic Temple at that place. Bids will be received until September 25.

The Dallas, Tex., Trust and Savings Bank will erect a three-story banking building to cost \$100,000.

The Scottish Rite Masons of Fresno, Cal., will build a \$100,000 temple.

The Automobile Club of Canada is making preliminary plans for a \$1,000,000 club house at Montreal.

The congregation of Notre Dame, Sherbrooke, Que., will build a \$150,000 school, after plans by J. W. Gregoire, of that place.

The Church of the Incarnation, Minneapolis, will erect a \$100,000 church building after plans by E. L. Masqueray.

The First Methodist Episcopal Church will also erect a new edifice, costing about \$150,000. Mr. Masqueray is also preparing plans for a \$100,000 church for St. Luke's congregation at St. Paul, Minn.

### Business Embarrassments

Jordan M. Samsel, of Point Pleasant, N. J., brought foreclosure proceedings against the De Flesco Gray and Brown Stone Company, of Wilburtha, N. J. The property of the company is to be sold to satisfy the judgment.

Paul W. Lippmann, formerly doing business as the Manhattan Marble & Tile Company, No 2496 Second Avenue, New York, has filed a voluntary petition in bankruptcy. Liabilities, \$7,004; no assets.

### Trade Notes

The Ingersoll-Rand Company, 11 Broadway, New York, has issued three booklets of interest to the stone trade. The first describes the Beyer barometric type of steam condensing plants. It gives the fundamental principles of steam condensing plants in minute detail and makes comparisons of the Beyer Barometric Condenser as against low level jet condensers and surface condensers. All auxiliary apparatus, such as vacuum pumps and centrifugal water pumps are illustrated and described in detail. Another describes the IR Model Leyner Drill Sharpener. To those interested in prop-

### CLOTH HALL AT MALINES, BELGIUM

Begun in 1340, but not completed until the 16th century. From a sketch by Charles R. Gilchrist in the *London Architect*

erly formed and sharpened bits, this bulletin will be of timely interest, as it explains and illustrates the sharpener in detail and shows the various styles of bits. Machine sharpeners not only make uniform bits but make them at less expense and with greater satisfaction than can be done by hand. The third booklet describes the Imperial "XPV" Duplex Steam-Driven Compressors, produced to meet a universal demand for a steam-driven air compressor designed and constructed to operate satisfactorily under "high pressures" and "superheat" as well as under "ordinary steam" conditions. Catalog shows the various sizes and capacities and explains in detail the operation of the "Imperial" piston valves.

Michael Cohen & Co., 8 West Fortieth Street, New York, have on hand a full supply of Meyer's Stone Cement, notwithstanding the European war, which might be expected to limit the amount in this country. Meyer's Cement has stood the tests of more than a quarter of a century, and is a necessity in every stone yard. Despite the greatest care, pieces will occasionally be broken from expensive stonework, and this cement furnishes the only satisfactory method of repair.



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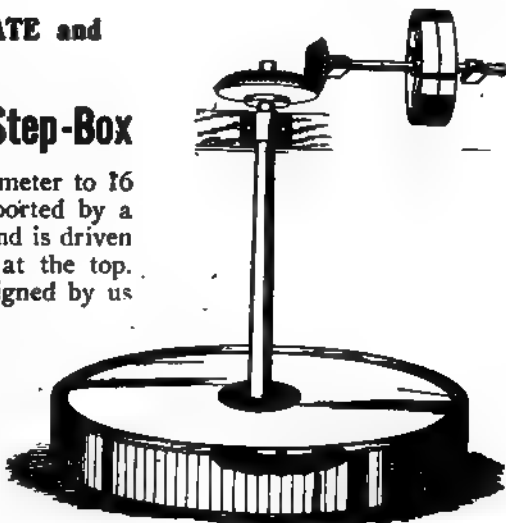
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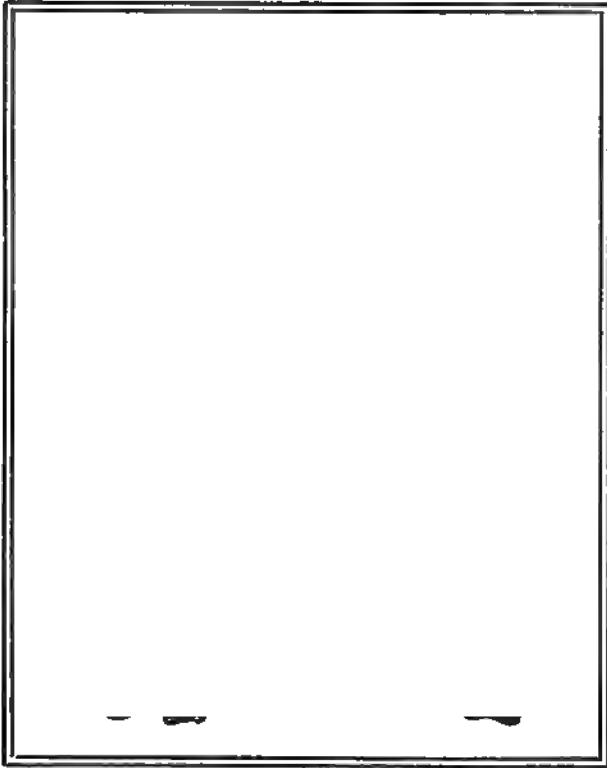
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# STONE

FRANK W. HOYT, Editor

VOLUME XXXVII

OCTOBER, 1916

NUMBER 10

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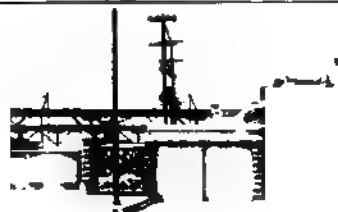
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## Good Mortars for Various Uses

**M**ORTAR for any kind of masonry is composed of sand, some cementing material and water, but the proportions of these materials and kind of cementing material to use depend on the kind, quality, and purpose of the masonry. A thorough knowledge of the materials used in making mortar should first be acquired if one wants to make mortar durable and at the same time economical, says a writer in the *Building Age*. The principle cementing materials used are portland cement and lime. There are several special cements used in pointing stone, which will be described later.

Any well-known brand of portland cement can be used for making mortar, as long as it is in good condition and is not too old. If necessary to test the cement, the most practical way is to make a pat of neat cement, keeping it in a moist place for twenty-four hours, then boiling it for three hours. If it shows no signs of disintegration, it is all right. This is a very reliable test.

Lime differs from cement in that it is a natural product, while portland cement is an artificial one. The quality of lime depends upon the purity of the limestone from which it is made. Lime is made by calcining limestone, which is mainly calcium carbonate and magnesium carbonate, the latter being classed as an impurity.

Some limes contain as much as 35 per cent. magnesium carbonate, which, of course, makes it a poor lime. These impurities in lime do not have any chemical action on the mortar, but simply act as adulterants like water does in milk; it simply takes on much more to get the same results. Since commercial limes in different parts of the country vary from 65 per cent. to 97 per cent. pure, it is necessary to have different mixtures for different limes.

Good lime should possess the following characteristics:

1. Freedom from clinkers and cinders and with only a small percentage of other impurities.
2. It should be in large lumps, free from dust.
3. It should slake very readily in water, forming a very fine, smooth paste without residue.
4. It should dissolve

5. It should increase from two and a half to three times in bulk.

Poor limes may be used for mortar for brick and stone work, but they should not be used in plastering. Lime should never be kept in a damp place, as it absorbs moisture from the air and soon becomes useless as a building material. For best results lime should be slaked as soon as possible after it is burned. Slaked lime will keep indefinitely if kept moist.

Hot mortar dries out very quickly and shrinks considerably, causing cracks in the mortar joint. It is far better to let it cool for at least twenty-four hours before using, and there is no reason why this should cost more or take more time if the work is planned ahead.

Hydrated lime, a specially slaked quicklime, is used very extensively in the United States for plastering and masonry, especially in cement lime mortar. This lime keeps well, is easy to handle, and makes good strong mortar.

Sand is used in cement mortar to cheapen it and prevent shrinkage. In lime mortar it adds strength in proportions up to three of sand to one of lime. After that, any increase of sand weakens it. Sand is an aggregation of loose, incoherent grains of crystalline structure, derived from the disintegration of rocks. It is obtained from the seashore, from beds and banks of rivers and from land deposits.

Sea sand is not very desirable because the alkaline salts attract and retain moisture, which acts on certain soluble substances in the lime and brick, causing them to appear on the surface in the form of white powder, commonly called whitewash, and is very noticeable on red brickwork. River sand is generally composed of rounded grains, and is very likely to contain clay and other impurities in the form of vegetable matter, which may, however, be washed out. Pit or bank sand grains are usually angular in form and of good size, but contain considerable clay and loam, which should always be washed out before using in the best work.

Marble dust, which is obtained from marble yards, is often used in laying stock brick where fine joints are necessary. Stone screenings are used in making mortar where a heavy joint is used, and is obtained

by screening the fine stuff from crushed rock for concrete work.

Recent tests and experiments have proved the following facts in regard to sand:—1. Sharp grains are not necessary. 2. The quality of sand is governed by the graduation of size of grains from coarse to fine. 3. Loam and clay are not always injurious, that is, a small amount of clay with coarse sand would be beneficial, especially in a poor mixture, but in fine sand would be injurious, particularly in a rich mixture. 4. Clay and loam are injurious to rich mixtures. 5. Dry sand is heavier than wet sand. 6. Coarse sand and cement make a denser mixture than fine sand and also require less water. 7. Coarse sand is heavier than fine sand with ordinary amount of moisture. 8. A sand in which the grains are graded from coarse to fine, with coarse predominating, makes the densest and strongest mortar.

When good sand is required, specifications should read as follows: Sand should be composed of grains that are hard, of crystalline structure, free from clay, loam, vegetable matter and salt. It should consist of a mixture of coarse and fine grains, with the coarse grains predominating; not more than 20 per cent. should pass a No. 50 sieve and not over 5 per cent. a No. 100 sieve.

A simple method to test sand for cleanliness is to take a fruit jar, put about 4 inches of sand in it, fill with water, shake thoroughly, and let settle till the water is clear; then the sand settles in the bottom of the jar, and a layer of clay, loam and vegetable matter on top of the sand. By measuring the thickness of this layer, one can compute the percentage of dirt in the sand.

### Stone of the Grand Canyon

The visitor who looks into the Grand Canyon from the vicinity of El Tovar may, when the first overpowering impressions give place to particular observations, note the great series of nearly horizontal rock layers whose varied colors and cyclopean carving give beauty to what might otherwise be a gloomy and terrifying sight. He may perhaps wonder how these beds of rock were formed, how thick they are, and how long it took for them to pile up, inch by inch, on the bottom of a now vanished sea. He is not likely, however, unless he is a trained observer, to have his attention attracted by the dark, less conspicuous rocks in the very bottom of the canyon or to see that these are very different in many ways from the stratified rocks above them. Yet these rocks—mostly tough crystalline granite gneiss and schist—which the river, after cutting through thousands of feet of the overlying beds, is now battering and grinding with its boulders, have an interesting story for those who may be able to read it. They are the oldest rocks in the canyon and, in fact, among the oldest in the world. They were in part deposited as sands and muds in a sea, in part accumu-

lated as lava flows, and in part intruded beneath the surface as molten rock. All these materials became solidified, and later they were slowly heaved and crumpled into mountains which were in time worn down by rain, rivers, and perhaps the waves of the sea to a nearly level land surface. This surface finally sank beneath the sea and became the floor on which fresh sediments began to accumulate. Twice at least was this mighty cycle repeated in the Grand Canyon region.

Recently, in an attempt to work out some of the details of this ancient history, L. F. Noble, one of the geologists of the United States Geological Survey, Department of the Interior, studied them at several places on the south side of the river where, often with considerable difficulty, he was able to get down to them. His collections were studied microscopically by another member of the Survey, J. H. Hunter. Their report, a scientific paper, has just been issued by the United States Geological Survey.

### Cost of Building Operations Increased

Building operations in many of the larger cities of the country increased in 1915 according to the United States Geological Survey, Department of the Interior. In 48 selected cities the total cost of building operations was \$641,769,199, an increase of \$22,016,845, or nearly 4 per cent. over 1914. Twenty-eight of these cities showed increase and 20 showed decrease. New York was the leading city in cost of building operations, with \$103,023,800, an increase of \$28,993,559 over 1914. Chicago, which was the leading city in 1914, was second in 1915, with building operations costing \$97,291,400, an increase of \$14,029,690. Brooklyn was third, with a total of \$45,601,851, an increase of \$3,729,544 over 1914. The number of permits issued or buildings erected in 1915 in these 48 cities was 201,190, a decrease of 2,542 compared with 1914. The number of permits or buildings ranged from 469 in St. Joseph, Mo., to 14,515 in Brooklyn, N. Y. The average cost per operation was \$3,190 in 1915 compared with \$3,042 in 1914.

### Opening a New Quarry at Gouverneur

Since purchasing the old plants of the Northern New York and Empire Marble companies a few months ago, the Gouverneur Marble Company has had men opening a new quarry on the Empire property at Gouverneur. The old Empire quarry produced some of the darkest and most valuable marble discovered in that section and the new owners believe there is still a large amount there. The stone will be taken out in huge blocks and transferred by rail to the mill of the Gouverneur company, where it will be cut and shipped or worked up into monuments. The demand for extra dark marble has exceeded the supply, and prices received have been higher than asked for other grades.

## Contractors and Sub-Contractors

**I**N modern building work one of the problems that seems most important and that calls for an early settlement is the relation between the general contractor and the sub-contractors. The complaints that are made as to present methods are generally put forth by the latter, and there seems to be much of justice in the charges. The sub-contractors in almost every line claim that they have a great deal of capital invested in their business, and that they have large and expensive plants to maintain. On the other hand, they say, the general contractor may have virtually no capital and no plant beyond an office, doing his business on the credit of the sub-contractors. If he fails, there is little protection for the latter, and many sub-contractors have been brought to bankruptcy through no fault of theirs. Another complaint is that the general contractor may and does withhold as long as possible proportional payments to his sub-contractors when he receives money from the building owner.

The most serious complaint, however, is that, although the general contractor bases his bid for any job on the figures given him by the sub-contractors, he does not feel himself bound in any way to the latter. As soon as he is awarded a contract, he will "peddle around" the sub-contracts and will use every means, sometimes very unscrupulous ones, to beat down the figures on which he based his original estimate. If the sub-contractors were so organized that they could prevent competition *after* contracts are awarded, every branch of the building trade would be benefited.

The Master Builders' Association of Canada is taking up this problem in the effort to find some satisfactory solution. Mr. Charles W. Carkeek discusses the question in the *Western Canada Contractor* from the point of view of a master builder. Mr. Carkeek suggests as one remedy for the evil that the master builders should not sublet the carpenter, the brick or the concrete work, but instead should employ competent foremen for each of these branches, with the foremen under the direct charge of the general contractor. Then he adds the following:

Now, to my mind, when a sub-contractor is invited to submit a tender, in his particular line of work, to a general contractor and that tender is used in the final making of his estimate, the general contractor should accord the same consideration the sub-contractor as he himself expected from those to whom he has submitted

a bid on the work as a whole. It should be understood, however, that such sub-contractor's bid is to be used subject to the approval of the architect. By adopting this method, or one along similar lines, the result would be that the most competent and responsible sub-contractors would be placed in the position where they belong, that is, at the front in their special lines. They would soon realize that in order to maintain their position they would be obliged to not only earn the good will of the general contractor, but the approval of the architect as well.

Another point that is worthy of consideration is a plan to destroy the evil temptation, the unmanly practice of what is, today, referred to as "Peddling of Sub-bids." This is really a clear case of "Peddling without a license," and should always be condemned. A general contractor often being awarded a contract, to secure which he previously depended on the assistance of a sub-contractor, should feel morally bound to enter into a contract with that sub-contractor for the work on which the latter submitted his sub-bid. I might offer, merely as a suggestion, a method that may be worked out to guard against the "auctioneering" or peddling system.

The suggestion is something along this line: That where a general contractor has invited sub-bids, prior to the filing of his general bid for the various sub-branches involved in the building, he, the general con-

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tractor, should acknowledge by mail the receipt of each sub-bid, at the same time advising each successful sub-contracting firm of his (the general contractor's) intention to use their bid, and that in event of being awarded the general contract he will expect the sub-contractor to enter into a contract at the price quoted in his estimate. I am not, however, offering this as a

final solution, but simply to give expression to the thought as it has presented itself to me.

There is one thought in my mind that is underlying and intermingled with all others: It is that the plans for the relations of the master builder and the sub-contractor, as well as all others engaged actively in the building industry, must be so made that in their final application they shall result in an efficient, economic and harmonious whole. And this to the end that the useful and beautiful creations of the architectural mind shall be adequately realized through the trained mechanical ability of the master builder.

Conditions in the building trade in England are somewhat different, and another view is presented by the London *Architect*. The writer says: "In the Middle Ages, despite all controversial attempts to assert the contrary, there can be little doubt that the architect was one of the operative workers, the master-mason. He had graduated through the stages of apprentice and craftsman before he attained the position of leader and director of his fellows. There are some amongst us today who would see in a revision to this system the salvation of the art and craft of architecture. But we cannot put back the hands of the clock or revert to the conditions of the past. When the progress of building reduced the supremacy of the stone-worker to an equality with other craftsmen, the master-mason no longer possessed the requisite authority to direct and control the operations of workers in other material, and there arose the necessity for an architect, who should be competent to co-ordinate the activities of independent trades. The master-mason was no longer supreme, but one of a group of masters, the master-carpenter, the master-smith, and so on.

"Then arose the practice in which the architect made arrangements and contracts, gave instructions and directions to each master-craftsman, separately and independently; a practice that still exists in Scotland and the north of England, but which in the south has in its turn been superseded in the march of progress by the introduction of the contractor, or master-builder, who assumed the responsibility for the proper conduct of all the trades and eliminated the friction and jealousy too often consequent upon the side-by-side employment of independent master-craftsmen.

"Now the multiplication of distinct industries and of the so-called specialists has introduced a new factor, the sub-contractor, whose precise relationship to the employer, the architect, and the contractor is, at this very moment, a question whose satisfactory answer is still to seek. We are inclined to think that the solution is a reversion in principle to the North British system, even, it may be, with the development of the personality common on the Continent, though extremely rare if not unknown in England, the architect-contractor.

"Just as the master-builder came into existence to ensure the co-operation of the various building trades

with the reduction of trouble to the architect-designer, so now that the master-builder as a contractor fails to achieve the smooth working and co-operation of the army of industrials, who are necessary to the completion of a modern building, it would appear that he must be superseded by some other system of control. The master-builder absolutely controlled, as their employer, every bricklayer, mason, carpenter, and laborer on the building, and could therefore accept responsibility for their work.

"The contractor is in an impossible position when some of the tradesmen are his direct employees and others are in a position of practical independence. A contractor can take the responsibility for the work of specialists only when these are part of his staff or directly under his control, and the architect, in this case, in order to exercise adequate direction and supervision of all the varied forms of mechanical engineering that find place in a modern building must be able to draw up a detailed specification, and see it carried out, for every one of them with as much exactitude as he now does for the bricklayer, the joiner, and the other purely building trades. This is one solution—to give the contractor as absolute a control over the specialists as he possesses over the operatives in the ordinary building trades with a correspondingly complete knowledge of detail and vigilance of inspection on the part of the architect.

"Is this latter condition feasible? The alternative is for the architect to make his contract with the employer and his sub-contracts with the master-builder or master-craftsmen and the specialists, in whose capability and honesty he has sufficient confidence to accept responsibility for their work without minutely detailed knowledge and supervision of all their operations. One other alternative there is, and it is being adopted by some firms who are prepared to meet the employer on the basis of supplying the design as well as the material and workmanship, the architect as well as the electrician being their employee or sub-contractor. But here already we have the contractor-architect. Surely it would be better for the dignity of the profession, as well as for the advancement of the art of architecture, that we should instead have the architect-contractor, with the architect in his proper position of supremacy."

### New Buildings for the Boston Tech.

Work is being pushed rapidly on the new dormitories for the Massachusetts Institute of Technology, at Cambridge, and also on President Maclaurin's new home, as well as on the Walker Memorial building. Plans call for the completion of the president's house, which will cost approximately \$130,000, by the end of the next school year. The Walker Memorial building is expected to be ready for occupancy some time during the course of the winter. The dormitories will

cost \$300,000. The social group of buildings, like the main structures, will be of Greek architecture with Italian influence. While they will be constructed in the same manner and faced with the same material as the educational group, they will be of a distinctly more residential type of architecture. The buildings will be of Bedford limestone.

### Demand a Trust for Carrara Quarries

The merchants and quarry owners have just sent in a new legal protest to the Government Representative in Massa against the extension of the lease of the Marmifera Railway to the Private Company, writes the Carrara correspondent of the *Stone Trades Journal*, of London.

Meanwhile another matter has begun to be discussed in Carrara. In order to finance the marble trade in the future so as to enable the quarry owners to employ more men as soon as the war is finished someone is proposing to the Government that an obligatory trust be formed amongst the marble producers with the purpose to put under the control of this trust the sale of all the marble produced all through Italy. This Trust should be financed, according to the proposal, by a special bank formed by the union of the Savings Banks of the marble districts, and this bank should also supply the necessary money for the purchase of the existing stocks and for advances to quarry owners.

In considering this proposal, other people say that it would not be advisable to go so far as the formation of an obligatory trust for the control of the sale of the whole of the marble production, but strongly recommended to form a special bank for the financing of the marble trade and industry with faculty to advance money on warrants for marble deposited in bond. This in order to avoid sudden stoppages of the works, as it happened at the beginning of the European war.

This financial organization should, they say, also make arrangements for the clearing of rubbish, which at the quarries cover so many good marble masses, provide for the building of the artificial harbor at our Marina, and for the more regular and cheaper shipping of the marble. It should also push the sale of marble in foreign countries

where it is not yet introduced by keeping stocks there. All this is proposed because the Carraresi realize that something must be done to restore the marble trade to the standard existing previous to the war, and they wish to avoid crisis, as the present one.

A better organization for the quarrying, clearing of

rubbish and cheaper and more convenient means of transporting and shipping marble ought to be arrived at; otherwise, with the increased cost of all the goods necessary for the quarrying, sawing and working of marble, and the shortage of hands, which is being realized even now that trade is dull and will be worse after the war, the cost of marble will most likely go up very much.

### San Francisco Bars Cobblestones

The old round cobble stone taken from the beds of California streams to make the first paving for the streets of San Francisco are to be banished. The Board of Works has decided to sell at public auction 80,000 that are now being torn up in the city's old Nob Hill residential section around Rincon hill. These stones have served as paving in that section since the early sixties. It is the fiat of the Board of Works that no more cobble stones are to be used for street purposes and that as soon as they are removed all such stones shall be sold.

### A Bust of Shakespeare in Limestone

Cleveland is to have a Shakespeare garden. This is on East Boulevard, north of Superior Avenue, N. E. It is to contain the various flowers mentioned in Shakespeare's works, the first planting having taken place in April, when E. H. Sothern and Julia Marlowe took part in the ceremony. Two Cleveland sculptors are

### CUTTING FLUTED MARBLE COLUMNS

These columns, shown in the rough in the preceding picture, are monoliths and are 13 ft. 4½ in. long by 2 ft. 2 in. in diameter

now modeling a bust of Shakespeare, which will adorn the garden. The sculptors are Joseph C. Motto and Stephen A. Rebeck, of 11634 Euclid Avenue. The bust and pedestal will be seven and one-half feet tall, and will be carved in limestone. The work is about ready to go to the stone carvers.

### Work on the Lincoln Monument

Henry Bacon, the architect of the Lincoln Monument in Washington, stated in a recent interview that all the authorities are much pleased with the satisfactory progress of the work; the builders are really getting along unusually well, and much faster than had been expected. All of the exterior columns of the building have now been completed, and one-half of the interior columns have been placed and the cornice completed. All the marble and interior stonework will be set before winter comes. The building will be completed a year ahead of time, that is to say, in June, 1917, instead of June, 1918, as planned.

"We are planning now for the mural decorations for the interior," said Mr. Bacon. "The subjects are not determined, but there will be two of these mural paintings, one of them to represent some of the inspired words of Lincoln in his second inaugural address, and the other to represent some of the passages from his Gettysburg address. This will be done by allegory. The painter will bring out some of the great qualities expressed in these speeches, such as the spirit of charity or the spirit of union. Jules Guérin is the artist who has been recommended to the commission to do this work. Contracts with him will probably be signed in the near future, along the lines I have suggested. Mr. Guérin is distinguished for the large mural decorations in the Pennsylvania Railroad Station in New York City. He was the director of color and in charge of all the mural decorations done by the painters at the San Francisco Exposition. He is most widely known, perhaps, for his illustrations of Egypt and other foreign countries in the more important magazines of the country."

Mr. Bacon, in the statement from which we have quoted, added that the mural decorations by Mr. Guérin and the portrait statue of Lincoln by Daniel Chester French will not be completed before the end of 1918—from which it may be inferred that the Lincoln Memorial will not be ready for dedication much before the winter of 1918-19. In the meantime, Mr. Bacon says, it is hoped to arrange for a basin of water in front of the steps and approaches, to serve as a reflection basin in which the building will be mirrored.

The carving of the names of the States on the frieze is progressing rapidly. Bids were recently opened for the work on the approaches, including the steps and a retaining-wall. The steps will be 360 feet long at their greatest length, and they will extend for a distance of 400 feet from the building. The retaining wall will be 187 by 327 feet, with a height of thirteen feet above the ground. These dimensions give some idea of the proportions of the monument and its majesty.

Work on the granite terrace walls and the masonry approaches will be started within a few weeks, and grading of the mound on which the memorial stands

is being pushed forward with all possible speed. Hundreds of workmen and scores of teams are engaged in the work of completing this mound, which necessitates extension of Potomac Park in the vicinity of the memorial into the river more than 200 feet.

Dredges are employed in the building up of the new ground, taking the earth from the river and piling it up behind the new seawall which is being constructed for the purpose. This work means that the park in the vicinity of the memorial, instead of following the line it now does along the driveway, will be bowed out 200 feet further into the river.

Officials in charge of the work say that landscaping and grading is one of the biggest tasks in the construction of the memorial, and explain that while a great part of this work has already been accomplished it will be weeks before the ground in the locality of the monument will begin to assume the appearance it is expected to take on according to the plans of the memorial.

### Strike Bluestone in Foundation Work

The Albany Evening Journal is about to erect a new building adjoining the immense structure of the Delaware & Hudson Company, near the river in Albany. The construction company in charge of the foundation work has encountered great obstacles. Bluestone has been struck thirty feet below the surface in driving piles, making it necessary to clear away the entire surface to remove the obstacle. This has all taken time and has delayed the work considerably. In clearing away the cellar, where the Journal presses will be, next to the Hudson River Day Line building, unusual trouble was met. Here were found foundation walls of old buildings, remnants of old piers and even an old log stockade used in the early defense of the city against hostile Indians. Near the Delaware & Hudson building, where the work is now progressing, similar trouble has delayed the operations. The dirt is completely filled with remnants of brick walls and old stone. This makes it impossible to use a steam shovel.

### Brooklyn's Public Library

Plans have been filed for the \$5,000,000 central public library in Brooklyn, which is to be erected at the junction of Flatbush Avenue and Eastern Parkway, adjoining the main entrance to Prospect Park. This improvement has been promised to Brooklyn for the last three years, and now a section with a frontage of 200 feet, for the administration offices, will be erected at once.

When completed the structure will be the largest library in this part of the country. With frontages of 475 feet on Flatbush Avenue and 430 feet on the parkway and a height of 136 feet the structure will be the prominent feature of the Prospect Park plaza, which

contains such buildings as the Soldiers and Sailors Arch, the Montauk Club, the Riding and Driving Club and many fine residences.

In design the new library will be much like the building at Fifth Avenue and Forty-second Street in Manhattan. It will be marble with limestone interior, and according to those who are interested in it will be the finest building in Brooklyn. It will follow the French Renaissance in style. Raymond F. Almirall designed it.

### Colorado-Yule Affairs

Bankers and others who are endeavoring to bring about a reorganization of the affairs of the Colorado-Yule Marble Company express confidence that they will be able to carry through their plans. There has not been a general response to the invitation to deposit securities with the Colorado National Bank of Den-

ver, and the time for this has been extended. One of the Denver newspapers, in speaking of the plan, says:

"The present capitalization of the company is \$12,500,000, of which \$10,000,000 represents common and preferred stock. In the proposed reorganization these securities will be scaled down to a total of \$4,221,475, of which amount \$1,000,000 will be preferred and \$1,500,000 common stock. These are to provide not only for the outstanding securities, but for cash requirements of the company. The reorganization is looked upon as a rather drastic one, but for the best interests of the security holders in the long run. No question exists as to the value of the company's property and business prospects and the committee's purpose as outlined is to bring its financial affairs down to a basis which will put it on a solid foundation and lead to its greater development."

## Indiana Limestone

**I**T is a truism of criticism that the architecture of a country is largely influenced and modified by the materials of construction that are readily available. Before the days of international commerce and the development of transportation, the genius of a people for architectural expression depended upon the local materials immediately accessible. No one could expect the dwellers in a flat, alluvial land, working through the medium of baked clay, to give to the world such buildings and monuments as came from the cunning and tireless hands of the Egyptians, with their mountains of granite, porphyry, basalt, quartzite, sandstone and limestone. Much of the stone the latter wrought was extremely intractable, and to this fact, as well as to their peculiar religious tenets, must be attributed the rigid and massive nature of their architectural art. Even the layman can understand how Greek art was tempted to fitting expression by great deposits of marble, and that Roman architecture would have been different had it used baked clay, or even granite, rather than marble, travertine and tufa.

It would be almost impossible to overestimate the influence that Indiana limestone has exerted on modern American architecture. Here was a stone that had life and warmth of color, that would weather admirably, that was sound enough to furnish blocks of any size that could be handled, and that was strong enough for any kind of construction. And yet it could be sawed rapidly, could be worked readily, and cheaply by machinery, and was as responsive as any stone to the carvers' chisel. What wonder that the architect found it an almost ideal material, since it could carry out any scheme of decoration his genius might create? It carried no suggestion that it was fragile or perishable, so that it could be used for massive walls and bold

mouldings. And it was equally fitted for architectural statuary or for the most delicate ornamentation. Moreover, it is suited either for exterior or interior use.

For many generations England has erected buildings of limestone. After the Norman Conquest, when William the Conqueror wished to celebrate his victory

ENTRANCE, ASTOR COURT APARTMENTS  
At No. 2424 Broadway, between 89th and 90th streets, New  
York. Architect, Charles A. Platt, New York. Cut  
in Indiana Limestone by George Brown & Co.,  
Newark, N. J.



with churches and abbeys, his thoughts naturally turned to his beloved Normandy. The master masons who worked his will brought over to his island kingdom shiploads of stone from the famous quarries of Caen. Beautiful as this stone is, however, it is suited only for decoration and not for structural work. It will not stand when exposed to the rigors of a severe climate. Later began the development of many English quarries of magnesian limestone. Much of this stone is beautiful in color and texture, and it is easily worked, but little of it weathers well. America is almost alone in the possession of a limestone, a pure carbonate and an oolite, that is at once strong, sound, durable and easy to work.

The extensive oolitic limestone deposits of Lawrence and Monroe counties, Indiana, have been known for many years, and generations ago the stone was locally used, always with satisfaction. It was at the beginning of the last quarter of the last century that the fame of

### Onyx Marble in Varied Colors

One of the oldest of decorative materials is onyx marble, examples of its use having survived from the earliest antiquity. The "precious alabaster" of the Scriptures, that figure in Solomon's Temple, was undoubtedly onyx and there have come down to us from the Ancient Egyptians sarcophagi hollowed out of huge blocks of onyx, that were used to contain the remains of royalty. One reason why onyx has been held in such high esteem through the ages is undoubtedly because of its comparative rarity. There are not many onyx quarries known in the world, perhaps a hundred in all, and of these not more than six are now in operation. One of the largest of these, and the most productive is that of the Pedrara Onyx Company, in Lower California. The company controls 5,000 acres, on which the Onyx everywhere outcrops. The quarries are located about 300 miles from San Diego down the Peninsula of Lower California, and about 55 miles inland from the Pacific Ocean.

One feature of the deposit is the unusual soundness of the stone, so that large blocks can be obtained. The color varies widely, ranging from pure white to green, rose, yellow, brown and blue. It is veined or clouded at times so that the most beautiful and unusual effects are obtained. The company has been producing stone for years and it has been used in some of most notable of recent buildings. The sales agents for the company are the Tompkins-Kiel Marble Company, 505 Fifth Avenue, New York, who have placed much of the stone in fine buildings in the East. The fact that the stone can be had in large sizes fits it for pilasters and wainscoting and it has been used for these purposes

in some of the most costly buildings recently erected on the Pacific Coast. It proves most effective for such use.

### Commission Favors a Confederate Monument

In their latest annual report to the Secretary of War the commissioners of the Vicksburg National Military Park renew their previous recommendation that Congress authorize the construction of a Confederate naval monument, to cost \$150,000, on an approved site on that battlefield. The military park covers an area of 1,322.63 acres and is improved by monuments, memorials, markers, guns, an observation tower, roads, bridges, etc. The United States government has expended \$1,421,000 on this park and fifteen states \$872,931.


### COLLAPSE OF A CONCRETE BRIDGE, INDEPENDENCE, ORE.

The structure failed the past month when the forms were removed and before any live load was being carried

the stone began to spread beyond the borders of the state. Unless we are mistaken, it was in the eighties that the first use of Indiana limestone can be recorded in New York. Almost immediately the stone grew into high favor, not only here, but throughout the country. Now it might be doubted whether there is a single city, village or town in the entire United States in which this stone has not figured in construction work.

Foreign visitors to this country are struck by the beauty and elaboration of our best buildings. What especially astonishes them is the profusion of ornamentation and carving, even in our business structures and residences. This is possible not only because we have wealth and enterprise, but also because our quarries yield stones that cannot be surpassed, if equaled, anywhere.

## Joints in Marble Deposits

 WHEN intersected by joints or fissures, marble blocks are said to be unsound. The term "unsoundness" refers to all cracks or lines of weakness, other than bedding planes, that cause the marble to break before or during the process of manufacture. The various types of unsoundness are known locally as "joints," "headers," "cutters," "hair lines," "slicks," "seams," "slick seams," "dry seams," or "dries," and "cracks." The term "reed" is applied to a weakness parallel with the bedding.

The presence of joints in marble deposits presents a most serious problem, writes Oliver Bowles, in "The Technology of Marble Quarrying," published by the Bureau of Mines, Washington. They may be so close and irregular that the quarrying of profitable material is impossible. Joints should have a marked influence on the mode of quarrying a marble, in order that the waste due to their presence may be reduced to a minimum. The manner in which joints occur and their probable continuance at depth are matters of supreme importance.

Most joints as they appear in marble deposits are straight and uniform, though some may be curved or irregular. Some are open and conspicuous and others so obscure that they can be recognized only by those skilled in their detection by long and constant practice.

Becker has pointed out that surface tension of water in joints tends to keep them closed. With a space of 0.01 inch the surface tension exerts a force of 13.5 pounds per square foot tending to draw the surfaces together, and if the opening is only 0.001 inch wide the force will be 135 pounds per square foot.

The most striking characteristic of joints is their tendency to occur in parallel systems. The occurrence of two systems approximately at right angles to each other is common. Occasionally a third or fourth system may appear. In exceptional cases joints may present such extreme irregularity that no well-defined system can be recognized.

The spacing of joints is variable. They have a tendency to occur in groups of closely spaced fractures separated by masses in which joints are few in number. In certain Vermont quarries such closely spaced groups are termed "fish-backs." In some deposits joints may be 10 to 30 feet apart, and in others they may be separated by a few inches only. Needless to say, a wide spacing adds greatly to the commercial value of a deposit.

In order that one may even approximately understand the distribution, direction, spacing, and persistence at depth of the joints that intersect marble deposits, a knowledge of their origin is necessary. Authors generally agree that joints are caused by strains in the rock masses. It is thought that few joints are due to tensile stresses, as joints so caused would show

no slickensided surfaces, and be irregular in form, whereas most joints are straight and even planes and are somewhat slickensided. It is now generally accepted that practically all joints are faulted surfaces although the displacement may be small. Daubrée was so firmly convinced of the correctness of this theory that he rejected the term "joint" as failing to imply the existence of relative motion, and introduced the terms "diacalse" and "paracalse." Joints are probably caused by pressure, and pressures in rocks may be highly complex. Curved joints indicate that the direction of effective pressure varies, or varied, from point to point.

The famous experiments of Daubrée indicate that joints may be produced by simple pressure, the joint planes forming at angles of 45° with the line of pressure. His experiments also show that torsion may cause joints. Torsional strain in glass produced two sets of fractures approximately at right angles to one

MEMORIAL TO REV. WILLIAM R. HUNTINGTON  
Just completed at Grace Church, New York. Architects:  
Parrish and Schroeder, New York. Cut in White  
Vermont Statuary Marble by Barr, Thaw &  
Fraser Co., Hoboken, N. J.

another and usually at angles of about  $45^\circ$  to the axis of torsion. Becker gives a reason for this arrangement. He shows that torsion of a bar causes diagonal lines to be elongated or contracted, the directions of maximum extension and compression being  $45^\circ$  to the axis of torsion and perpendicular to each other. Cracks in fan-shaped groups may also result from torsion.

Crosby claimed that earthquakes were important factors in the production of joints, each system being parallel with the earth waves producing it. Various systems must therefore have resulted from successive shocks. A second system will usually be nearly at right angles to the first, as an oblique shock would have found relief along the fractures of the first system. The presence of an oblique system presumes a shock of such high velocity that time was not allowed for the strain to find relief along previous fractures. The same author in a later publication shows convincingly how shock and torsion may act in conjunction and produce results according with the phenomena as they occur in nature. His theory, in brief, as is follows:

The torsional theory assumes a very slow, and the earthquake theory a rapid, process of joint development. As fractures formed by slow processes are apt to be irregular, following all places of weakness, torsional joints should be irregular. Most joints, however, are fairly regular and are even known to pass directly through the hard pebbles of a conglomerate. Thus, a discrepancy appears in the torsional theory. A single system of regular joints may therefore be ascribed to shock. A subsequent shock in a transverse direction would tend to break up the sheets formed by the joints, the fractures being of a less continuous nature than those produced by the first shock, being terminated abruptly in many places by the first system of joints and continuing in a different though parallel plane. Thus two systems of an unlike character are best explained by the earthquake theory. However, two systems of like character may be referred to the torsional theory except when they exhibit the regularity indicative of instantaneous stresses.

Crosby refers to the idea, upheld by many geologists, of an almost universal condition of strain in the earth's crust, and states that if, while under torsional or folding stresses, the rock is traversed by an earthquake wave, fractures may be precipitated. Experiments with sheets of glass showed that a sudden shock while the torsional strain was distinctly below the breaking point would precipitate the fractures, but that the direction of the fractures was governed by the direction of the axis of torsion. It seems reasonable, therefore, that the result of an earthquake wave traversing rocks under strain would be the sudden development of joints, governed in direction by the torsional or folding stresses present.

Hundreds of examples might be given of joint systems, and many quarrymen could supplement them with illustrations from their own experience. On the

other hand, in some quarries joint systems may be difficult to recognize. They may be obscure and seemingly rather irregular. However, careful mapping of many of them will reveal definite systems.

The disappearance or continuance of joints with depth is a matter of profound importance to quarrymen. The belief is common that joints are less numerous at depth. Some persons who hold this opinion can support it by observations in quarries, whereas with others the idea is the expression of an unverified optimism. The origin of joints and the phenomena accompanying their development have a direct bearing on their persistence at depth.

Becker has shown that a mass of rock must occupy a greater space after jointing than before, as cracks and open corners are produced. Thus as joints demand increased volume in the mass of rock affected, and as surface rocks have freedom of upward motion, whereas deep-seated rocks are more or less restrained in all directions, there is a stronger tendency for joints to form near the surface than at depth. As pointed out by the same author, the pressure on rocks at depth does not obviate the tendency for fractures to form, but may prevent actual ruptures.

It is evident, however, that a condition of flowage demands an immense superincumbent load, and takes place, therefore, at depths far beyond the reach of quarry excavations. If deformation without rupture takes place within the limited depth of a quarry pit, it must be by some other phenomenon than that commonly called flowage.

Deformation may take place at moderate depth by the formation of crushed structures which may be masked by recrystallization. Furthermore, deformation without rupture may take place by twinning, or the development of gliding planes in the calcite crystals. As gliding planes have been produced in the laboratory, it is evident that they may occur in nature under pressures of no greater magnitude than those brought about by a superincumbent load of rock within the vertical range of a quarry pit. Deformation may take place by one of these means at moderate depths.

In theory, therefore, joints are characteristically surface phenomena, and should decrease in number with increasing depth. This theory is generally substantiated by the conditions disclosed in quarrying. The decrease may not be constant or uniform. Certain beds are more liable to be intersected with joints than other beds, and in consequence one bed may have more joints than those above it. In general it has been found, however, both in quarrying and in projecting core holes, that if any one steeply inclined bed is followed downward the unsoundness constantly decreases.

Certain fractures, known locally as "slicks" or "hair lines," are, as a rule, evenly spaced, vertical, and at right angles to the strike of steeply inclined beds. They usually disappear at depths of 50 to 100 feet.

They are regarded as originating from the expansion and contraction of rocks owing to variations in solar heat.

Unsoundness in quarries of serpentine marble, or what is commonly called "verd antique," is usually rather pronounced and extremely irregular. It is probably caused chiefly by expansion or swelling, owing to the process of hydration as the serpentine is formed. As a consequence, no definite systems of cracks are to be expected. The formation of lens-shaped masses is common. It is frequently difficult to obtain blocks of any considerable size sufficiently coherent to be of commercial value. Occasionally the cracks are recemented by crystalline calcite, producing an attractive white veining on a green background. The so-called brecciated marbles are extremely unsound masses composed of many irregular and usually angular fragments that have been cemented by chemical precipitation of calcium carbonate.

In certain quarries joints that have been recemented in the manner described above are termed "glass seams." They may be sufficiently strong to permit sawing even into thin stock, but most of such seams are planes of weakness. The filling is most commonly of calcite. Occasionally it is of silica, either as quartz, flint, or chert. The silicious filling is least to be desired, as its extreme hardness makes sawing and polishing difficult, and it presents a nonuniform surface. In any case a glass seam usually appears as a conspicuous line which can be regarded only as a blemish when present in otherwise uniform marble.

### Quarry Company Ties Up the Storm King Road

It will be remembered that a great deal of trouble has attended the building of the Storm King highway in Orange County, New York. It was necessary that the highway, as planned, should pass through a portion of the property of the Storm King Stone Company. The company declared that the right of way, although only 60 feet in width, would totally destroy the value of their property for quarrying purposes, and they demanded between \$400,000 and \$500,000 for their holdings and plant. Condemnation proceedings were instituted, and a commission took testimony for weeks. Finally the commission awarded damages of \$48,475, which the company at first refused to accept, but the award was confirmed. The J. L. Hayes Construction Company has the contract for building the road. The mountain is very steep at this point, and in blasting for the highway it was impossible to prevent rock from rolling onto the property of the stone company. Several large boulders broke through the crushing plant and injured the machinery. The Storm King Stone Company thereupon obtained a temporary injunction against the Hayes Company, restraining the latter from further blasting in such a manner as to throw the rock off the right-of-way and on to the property of the plaintiff. After

argument, the injunction was made permanent, with the result that the construction of the road was stopped.

The Board of Supervisors of Orange County has now passed an ordinance authorizing the Good Roads Committee to negotiate for the purchase of the balance of the land of the stone company, and failing in this to begin proceedings for the condemnation of such additional land as may be necessary for the completion of the road. It has been stated that the company would accept \$50,000 for the remainder of its property, but it is regarded as improbable that the supervisors would pay such a sum.

### Teamsters and Merchants Want Granite Blocks in Boston

The Department of Public Works in Boston has been giving a hearing on the proposition to repave Devonshire Street. A number of business men having offices on the street recommended that wooden blocks be used, on the grounds that granite was too noisy.

The first of the opponents to wood-block paving in this stretch of thoroughfare was George F. Stebbins, representing the Team Owners' Association. He declared that Devonshire Street is the only available thoroughfare for heavy trucking between the South Station and the North Station, and that if it is to be repaved with wooden blocks, particularly between State Street and Adams Square, the teamsters may as well throw up their hands. "Heavy trucking cannot be done efficiently over a wood-block pavement," said Mr. Stebbins, "and the result, if you lay wooden pavement, will be smaller and therefore more frequent loads—and this street is already congested with teaming."

Dr. F. H. Rowley, president of the Massachusetts Society for the Prevention of Cruelty to Animals, said that he quite agreed with those who want quiet offices, but that if absolute quiet could be had only at the sacrifice of the horse, then approximate quiet seemed the proper compromise.

Zenas W. Carter, representing the Granite Paving-Block Manufacturers' Association, said that under the improved method of laying granite pavement, the road is smooth and comparatively noiseless and that New York City is now laying this kind of pavement almost wholly in its business section.

The streets in New York that are paved with wooden blocks or asphalt are almost impassable for heavy loads in wet weather. Added to this is the fact that wooden pavements are apt to buckle badly when the blocks swell with moisture, and that the most carefully laid asphalt will not stand up under heavy traffic. Well made granite blocks, carefully laid on a good foundation and grouted with cement not only furnish the most durable of all pavements, but also one that is not particularly noisy.

# STONE

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No. 10

A RATHER strange incident took place in a Chicago cemetery during the past month. A monument was to be dedicated in memory of a Chicago soldier killed in Vera Cruz two years ago. Before the dedication exercises could begin, however, the brother of the dead boy broke through the crowd and declared that there would be no dedication. He said that the entire move was an advertising scheme of a fraternal order that had erected the monument. The officials of the order had agreed to pay one-half of the money collected for the memorial to the parents of the dead soldier, but no payments had been made and there had been no accounting for the funds. The dedication was postponed.

A TAXPAYER in Oregon writes to one of the leading newspapers in that state protesting against the proposed legislation to give the farmers limestone for agricultural purposes. The measure that is under discussion is drastic, and would give the state the power to purchase or confiscate limestone deposits and operate them with convict labor. The writer objects to this on the ground that the benefits accruing would be purely local and not for the good of every one in the state. He claims that if state quarries are to be operated and convict labor is to be employed it should be for the construction of improved highways. As we have pointed out more than once, there is no reason why the state should go into the business of stone production, and enter into unfair competition with a legitimate industry. It may be granted that ground limestone is a necessity to correct the acidity of the soil, but why should it not be purchased in the open market, the same as any other commodity? Why should the state furnish this, any more than chemical fertilizers or agricultural implements? For some unaccountable reason, the legislators seem to think that

the state has a perfect right to enter into competition with the quarrying industry. It is time for the stone men to register a solemn and emphatic protest.

A STATEMENT by James Duncan, president of the Granite Cutters' International Association of America, is making the rounds of the press. In this, Mr. Duncan calls attention to the fact that, since Labor Day, 1915, workmen in the granite industry have made considerable gains by adoption of a number of trade agreements, carrying an average increase in wages of 75 cents per day and placing the minimum wage rate for an eight-hour work day at not less than 50 cents per hour. Then Mr. Duncan says: "A slump in the building industry affected our trade, making it more memorable that we were able to secure material advantages in wages and conditions this year."

To the average business man the fact that this union, one of the strongest and most closely organized of all, has used its undoubted power to enforce higher wages and shorter hours during a period of marked depression in the trade is not an achievement that calls for much boasting. Every fair and honest man must be glad to see labor get its full rights and that the conditions that make for health and safety are rigidly guarded is a matter for congratulation. But labor is prone to overlook the fact that it cannot make a permanent advance if it lays undue burdens on the employer, and that a wage for the former cannot continue without a profit for the latter. It is the high cost of labor that is the ultimate reason for the present lack of marked activity in building.

## Boasting—and Apologizing

One of the leading concrete publications has adopted for its motto "Concrete for Permanence," which appears in big letters on its cover. This sounds very well, but it would be more convincing if the contents of the periodical itself showed anything to justify the boast. If one opens the pages of the latest number he is confronted with an article on "Repairing and Patching of Concrete," and he naturally wonders what is the necessity for patching and repairing if the material is so permanent. Then follows an article on "Waterproofing Stucco," which deals with the general complaint that dampness comes through stucco walls causing the material to flake off and decay, and suggesting a treatment that may (or may not) obviate the trouble. A third article takes up the "Factors Responsible for Poor Concrete Pavements," while a fourth deals with "Concrete Floors, How to Overcome Their Dusting." Still another discusses methods for preventing transverse cracks in concrete road building.

It will strike most fair and open-minded persons that this is a great deal of apology and explanation for a material whose advocates are continually boasting of its strength and durability. It must not be

thought that this is any isolated instance. Every concrete paper that one takes up is full of similar articles. The engineering journals, while they must be ranked among the concrete advocates, are constantly describing and illustrating concrete failures and collapses, often extremely costly, and attended with loss of life. The concrete structures about which they boast are those still in process of construction or but just completed. They speak confidently of their strength and durability as if, like the Egyptian Pyramids, they had weathered the assaults of countless centuries. They have little to say, however, about the structures five and ten years old, like the boasted concrete viaducts and retaining walls of the Lackawanna railroad, for instance, on which gangs of laborers are constantly at work scraping, patching and repairing.

When the cost of concrete, artificial stone and terra cotta is contrasted with that of permanent materials like brick or stone, it is the initial cost alone that is mentioned. No account is taken of costly and continual renovation and repair. The city of New York thought to save a few thousand of dollars by substituting artificial stone for granite in the arcades of its great Municipal building. It has been patching and repairing these walls ever since, and the end is not yet. Added to this it must not be forgotten that the counterfeit work is stained and unsightly, and will always remain so. Municipalities are slow to learn a lesson. Following the same cheese-paring methods, the officials have planned to use sham material in place of honest stone in various parts of the proposed County Courthouse. If they can save a little money now, what matters it to them if they leave to their successors the ungracious task of patching and trying in vain to cover up sham and shoddy work? The good name of the city for sturdy honesty seems to count for nothing.

#### Inscriptions for Imitation Stone Churches

The local newspapers make the announcement that a Presbyterian congregation in Albany is about to build a new church edifice. This is described as a modern and handsome structure. It is to be of brick with trim, including the cornice, of *artificial stone*. Has the thought never occurred to this pastor and congregation that there is anything incongruous in a House of God that uses pretentious ornamentation of a material that seeks to counterfeit honest natural stone, in other words, a palpable sham? In all sincerity we make a suggestion to the members of this church. Let them place at the side of the pulpit a tablet of artificial stone, preferably with cast ornaments simulating carving, and having this inscription: "Thou shalt not bear false witness."

It is customary in these days to carve inscriptions over the entrances of monumental buildings. Inasmuch as there seems to be a growing tendency to use sham materials, even in our houses of worship, we

would suggest the following inscriptions for such structures:

The proud have forged a lie against me.

Psalm cxix; 69.

Thou makest this people to trust in a lie.

Jeremiah xxviii; 15.

The houses of Achzib shall be a lie to the kings of  
of Isreal.

Micah, i; 14.

Who changed the truth of God into a lie.

Romans i; 25.

For if the truth of God hath more abounded through my lie unto his glory, why yet am I also judged as a sinner.

Romans iii; 7.

And for this cause, God shall send them strong delusions, that they should believe a lie.

II Thessalonians ii; 11.

And there shall in no wise enter into it anything that maketh a lie.

Revelations xxi; 27.

For without the Gates of the Holy City are who-soever loveth and maketh a lie.

Revelations xxii; 15.

These are all good Biblical texts, and no one can deny their appropriateness.

A PECULIAR controversy is being waged in Watertown, N. Y. The board of public works thinks that the water board should furnish to the former body crushed stone for street work either free or at the actual cost of crushing. The water board does not see things in that light. It admits that it has from \$25,000 to \$30,000 worth of crushed stone on hand, but it declares that it cannot furnish water at cost, pay its bonds and meet other expenses without some source of income. It is selling the stone to private individuals at 20 per cent. more than it is charging the city. The general public might ask why it is that any branch of the city government should engage in the stone business. A somewhat similar fight is in progress at Trenton, N. J., the city authorities claiming that they are not getting their fair share of crushed stone from the county quarries. If cities and towns bought their stone in the open market, it would be a better deal all around.

#### Production of Granite in Sweden

Wages received by the workmen at the Swedish granite quarries are high on account of the difficult nature of their work, writes Consul General Ernest L. Harris, from Stockholm. It is calculated that a paving-stone hewer ought to be able to earn 1,500 crowns (\$402) a year. The work is generally contracted for. Building and square hewers generally get 10 per cent. higher wages than the paving-stone hewers.

Conditions are now poor in the granite industry, because the war has made the exportation to foreign countries almost impossible. Considerable stock has been gathered, however, chiefly in the German dimensions: 12/15 centimeters broad, 16/18 or 18/20 high,

and 15/25 long (centimeter=0.39 inch). No exact statement, however, can be given concerning the size of the stock.

The general opinion in Swedish stone-working circles is that there can be no exportation to America on a larger scale than at present. Some firms have tried to produce paving stones in the size that is used in America, but it has been shown that the production of such a stone meets with technical difficulties, partly because the American stone is much narrower and longer than the kind of stone that the workmen are accustomed to produce here, and partly because it is especially difficult to get the Swedish granite as mellow as that in America. The workmen have therefore objected to the production of the American kind of stone. The high freights, moreover, will certainly during many years make stone exports very difficult.

### New Terrazzo Plant

The Middlebury Marble Company, of Middlebury, Vermont, producers of Middlebury pavonazzo and creme antique marbles, has completed a modern crushing and screening plant for the manufacture of white terrazzo, with a capacity of 30 tons per day. Middlebury marble is a hard, fine-grain marble, the various layers running from a delicate cream white, devoid of color or veining, to a dark, heavily-veined olive green. The company is using the waste from the white layers in the new terrazzo plant, and because of its hardness, it makes a terrazzo of unusual wearing qualities.

### New Companies

The Rock Castle Cement and Lime Company, of Pine Hill, Ky., to crush limestone and manufacture Portland cement. Capital, \$1,500,000. Incorporators: Robert S. Maslin, Harry J. Matthews, Waldo Newcomer, Baltimore, Md.

The Andrew D. Baird Holding Corp., of Brooklyn, N. Y., to do a general stone cutting business. Capital, \$250,000. Incorporators: V. A. Lersner, A. B. Gritman, A. D. Baird, 140 Hewes Street, Brooklyn, N. Y.

The Italian Marble Works, Inc., of New York, to manufacture statuary, marble, stone, etc. Capital, \$10,000. Incorporators: E. M. Beyhl, F. B. Knowlton, J. B. Cuneo, 64 West Twelfth Street, New York.

The Hotaling Quarry Company, Inc., of Raven, N. Y., to quarry and deal in stone. Capital, \$5,000. Incorporators: A. Van Hoesen, E. P. Hotaling, J. Eddy, Albany, N. Y.

The Ardmore Rock and Gravel Company, of Ardmore, Oklahoma, to quarry and deal in gravel, rock, etc. Capital, \$25,000. Incorporators: S. W. Tyer, F. N. Prueit, Ardmore; J. R. Taliaferro, Lone Grove.

The Woodson & Kratch Monument Company, of Louisville, Ky., to do a general monumental business and deal in marble and granite. Capital, \$10,000. Incorporators: Isaac T. Woodson, Fred A. Kratch, C. E. Woodson.

The Eastern Marble Company, Inc., of New York, to do a general marble cutting and gravel business. Capital, \$10,000. Incorporators: G. J. Giudici, E. Rosa, A. Terrandva, 423 East Twenty-second Street.

The Barry Sand and Gravel Company, of Barry, Ill., to deal in gravel, sand, etc. Capital, \$35,000. Incorporators: George Edward Hoffman, John C. Brendt, Joseph Webb.

Robert Catella, Inc., Bronx marble monuments, statuary, mausoleums, etc. Capital, \$5,000. Incorporators: J. W. Kavanaugh, G. Bajetta, R. Catella, Webster Avenue and 233d Street.

The American Sand and Gravel Company, of St. Louis, to do a general sand, gravel and stone business. Capital, \$25,000. Incorporators: Marie S. Prendergast, Randolph Laughlin, Jeff J. Prendergast.

The Modern Mausoleum Company, Inc., of Waverly, N. Y., to construct mausoleums. Capital, \$10,000. Incorporators: E. S. Hanford, H. A. Ellis, E. K. Ketcham, Waverly.

The Superior Marble Company, of Chicago, to manufacture and deal in marble. Capital, \$2,500. Incorporators: Gordon M. Proudfoot, Edwin S. Braden, Louis Rathmann.

The North Georgia Marble Products Company, of Barbourville, Ga., to manufacture and deal in marble. Capital, \$50,000. Incorporators: C. P. Kennedy, R. H. Hewitt and Theodore D. Tinsley.

The Barkwill-Farr Company, of Cleveland, Ohio, to construct quarries. Capital, \$4,000,000. Incorporators: J. A. Jackson, Lawrence B. Koblit, Robert J. Dawson, Ernest S. Barkwill, Ernest W. Farr.

The McGovern Granite Co., Inc., of Barre, Vt., to manufacture and deal in granite. Capital \$50,000. Incorporators: Daniel J. Hayes, of Montpelier; Robert McGovern, of Hartford, Conn.; Frank and Cirillo Broggin, of Barre.

The Baltimore Peach Bottom Slate Corporation, of Baltimore, Md., to quarry and deal in slate. Capital \$200,000. Carl L. Gray, Jr., president.

### Obituary Notes

Howard L. Woody, who until he retired last December was superintendent of public offices and buildings in Brooklyn, died the past month after a long illness. For many years Mr. Woody was one of the best-known stone dealers in New York. He was born in Fountain City, Ind., forty-seven years ago, and in early life was a newspaper writer. He was twice a member of the Legislature of New York. Mr. Woody was widely known and greatly liked in stone circles.

M. Odell, a well-known marble man of West Rutland, Vt., died the past month at the age of 72 years.

William J. Hendershott, a widely known quarry man and for the past five years in charge of the Marble Cliff stone quarries near Columbus, Ohio, died the past month at the age of 47 years.

John J. Sinclair, for many years a member of the old stone firm of James Sinclair & Sons, in New York, died the past month at the age of seventy years. Mr. Sinclair furnished stone for the Vanderbilt and Sloan mansions in New York, and for the Biltmore home of George W. Vanderbilt, as well as for many other important buildings.

A. L. Baird, for many years a member of the well-known firm of A. L. and W. W. Baird, stone setter of Brooklyn, died during the past month. His brother, W. W. Baird, died about a year ago. Both of them were brothers of Andrew D. Baird, the well-known cut stone contractor of Brooklyn. Mr. A. L. Baird was 72 years of age and had been in the stone set business for about 30 years. Among the notable buildings that this firm erected were the Brooklyn Institute of Science and the New York Telephone Building.

H. A. Sheffield, a well-known granite and marble dealer of Chagrin Falls, Ohio, died recently. He had been engaged in the marble business for many years and was widely known in the trade.

James E. Burke, for many years prominently identified with the marble interests of Vermont, died at his home in West Rutland the past month, at the age of 50 years. He founded the Orville Marble Company and was also interested in the formation and growth of the Clarendon Marble Company, of which he was secretary at the time of his death.

## A Three-Light Tracery Window

THE accompanying design is for a three-light window in the Perpendicular style of architecture. It can be adapted to most positions by varying the height of the lights from springing line to sill, says a writer in the *Building World*.

The dotted lines on the illustration show an easy method of setting out this window by means of equilateral triangles. One of the main points in setting out tracery windows is the laying down of the centre lines, and this can be settled by deciding the width of the light and the size of the mullion, as shown in Fig. 5, and then setting off the triangular lines, as shown. Where these triangular lines intersect the horizontal lines, the centres for striking the tracery will be found, and after the main lines are got the cusping can be filled in as shown.

There are many ways of finishing the interior walls, etc., of the window; that shown is for plasterwork on rough stone or brick, with dressed stone for the interior sill of the window. A pointed or flat arch in brickwork, plastered on soffit as shown, can be used for interior finish. Bonding stones, marked A on the section (Fig. 2), should be used at intervals.

As stated above, a matter of the utmost importance in setting out tracery windows is the correct laying down of the centre lines. These centre lines can only be fixed when the width of the light and the size of the mullions have been settled.

From the centre line (see Fig. 5) set off the inclined dotted lines forming an equilateral triangle, and where these inclined lines intersect the horizontal lines, the striking points for the main cusping are obtained as shown. This is also demonstrated again in Fi

but it is not necessary for these lines to be equilateral, as their form often depends upon the height allowed for the head of the window; but the same principle is observed. The next thing is to decide on the cusping, and this is often a matter of taste, as the top cusp is sometimes larger than the others; but in the case under consideration the cusplings are of equal size and are struck from the centres shown. It is better to try the circles before finally settling the size of cusps, in order to see how they will work in.

The bottom and top cusps should be tried first, and from the points at which the circle for the top and bottom cusp is struck set off a circle of any radius, and draw a line through the point where the circles intersect at top and bottom. This line will give the centre line for the middle cusp. The circles must be set out so as to give the proper width for the points of the cusping.

For obtaining the intersections of the sunk portion of the cusping, on the main ribs a a form a circle of any radius from the points A A, and at the point where the circle intersects draw a line as shown; this line will give the desired intersection. The above rule is applicable whatever width the circles may be that form the cusping.

In order to obtain proportionately equal projections for all

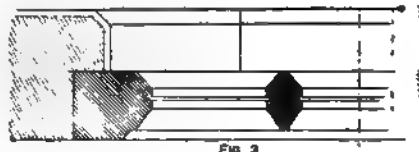
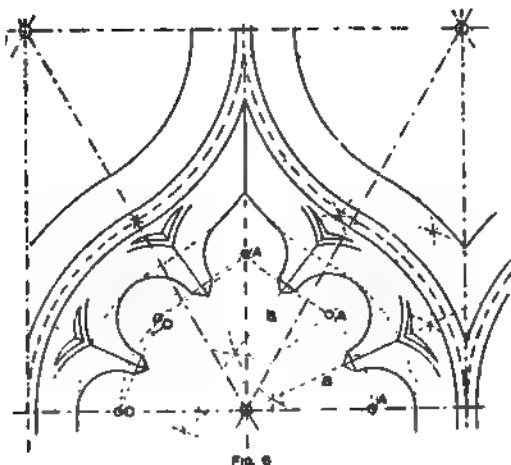


FIG. 3

FIG. 4





the cuspings, draw a line from the striking points c c, and where this line cuts across the point of the cusp the projection is found.

### Notes from the Stone Fields

#### MARBLE AND GRANITE

A. W. Frazier, formerly connected with the Kimball Brothers Granite Works, at Lincoln, Neb., has bought from J. A. Salter a half interest in the Shenandoah Marble Works, at Shenandoah, Ia., and has removed to that place.

There has just been consecrated in the Church of Our Lady Help of Christians in Albany a very elaborate and beautiful altar, the gift to the church by Mr. and Mrs. James C. Farrell, of that city. The altar was designed by Edward A. Allen, No. 505 Fifth Avenue, New York, and is carried out in Italian, Cipolin and Egyptian marbles.

The Frank Odgers Company, granite and marble dealers of Watertown, Wis., have established a branch at Escanaba, Mich., to be known as the Peninsula Granite and Marble Works.

During the past month there has been a formal opening of the magnificent new building of the Brooklyn Trust Com-

leader of Ohio, will erect a monument of Barre granite to the memory of her husband.

An injunction suit has been begun by the Beaver Dam Marble & Quarries Company, asking that the Beaver Dam Marble Company, of Baltimore, be restrained from further quarrying stone at Texas, Md., and be compelled to give an accounting of all stone removed since September 1, 1916, the date its five-year lease expired. It is contended by the owners of the property that the defendant company leased the property for five years and at the expiration of the lease, August 31 last, it wanted to continue for one year. This proposition, it is alleged, was refused, and later the defendant company agreed to quit the premises within 60 days. A temporary injunction was granted, with leave to the company to move for its dissolution.

The Parkside Methodist Episcopal congregation of Camden, N. J., is building a handsome new church. The edifice is of Avondale granite, with trim of Indiana limestone.

The Marathon Granite Works is building an addition, 42 by 150 feet, to its plant at Marathon, Wis. This will be equipped with ten surfacers, and an exhaust system for carrying away the dust.

The firm of Mariner & Tupy, of Sioux City, Ia., is installing machinery for sawing, polishing and finishing marble in its new plant in that city.

Schueler Brothers Company, of Nashville, Tenn., has been awarded contracts by the Caldwell-Marshall Company, of Indianapolis, Ind., for furnishing and installing the marble work in the Hotel McCurdy, Evansville, Ind.; Hotel Shawnee, Springfield, Ohio, and the Aurora Hotel, at Aurora, Ill. The work will be done in Tennessee marble.

It is reported that damage amounting to \$10,000 was done when a huge granite monument being set in place in the cemetery of the Miriam Osborne Memorial Home, at Harrison, N. Y., toppled over the past month. The accident was due to a breaking rope, which permitted the shaft to swing against the base.

The state of Iowa has purchased just east of Rowena, Minnehaha County, near the South Dakota line, a quarter section of land underlain with Sioux Falls granite. A big quarry will be opened and a crushing plant installed.

The contract for the marble work in the Seneca Hotel, now in course of construction at Columbus, O., has been awarded to the Wege Marble & Tile Company, of that city.

The Kain Granite Company, of Helena, Mont., has been awarded the contract for furnishing the granite for the \$200,000 Murray Hospital at Butte. The granite will be quarried at Clancy, Mont., and will be cut in Helena.

A handsome granite monument has been erected over the grave of the Rev. Thomas Lorente, who died in 1915, at Rosaryville, near Pouchatoula, La. The work was done by the Albert Weiblen Company, of New Orleans.

A monument of Quincy granite, 24 feet in height, has been erected at Germantown, Mass., in memory of Daniel Shedd, the first of the family name in America, who settled in that town in 1642.

The state of Ohio has just erected a handsome monument over the grave of Thomas Kirker, its second governor, in the little hamlet of Kirker, Adams County. Governor Kirker died nearly 80 years ago, and his resting place has been marked only with a rude marble slab.

The Montana Daughters of the Confederacy have presented a memorial fountain to Helena, which has been erected in Hill Park. It is cut in Montana granite.

The Phenix Marble Company, of Phenix, Mo., and Kansas City, Mo., report trade conditions most satisfactory. August and September have compelled over-time in all departments, that is—quarry, mill, tile and cut stone. Their mill has been

#### ASHTED CHURCH, SURREY, ENG.

A medieval stone structure still in good condition. From a sketch in the *Building World*.

pany, at Montague, Clinton and Pierrepont streets, Brooklyn. The design of the building, Romanesque in character, is by Messrs. York and Sawyer, and it was built by Mark Eidlitz & Son, all of New York. The cut stone work was by James McLaren and Sons, of Brooklyn. The elaborate entrance, illustrated in these pages several months ago, is carved in Napoleon Gray marble.

Vermont's oldest marble quarry, opened about 1795, is still being operated profitably.

The annual meeting of the interstate board of the Perry's Victory Centennial commissioners, which is made up of the United States commissioners and the commissioners from all the states which participated in the celebration, was held in Cleveland the past month. Announcement was made that the state of Pennsylvania is planning the erection of a granite and bronze memorial at Erie, Pa., to commemorate the building of six vessels of Commodore Perry's fleet in that city. New York has marked the anniversary of the victory of Lake Erie by the erection of a statue of Perry in Buffalo. The general memorial, it will be remembered, is the magnificent granite shaft, 352 feet in height, recently completed at Put-in-Bay, near Port Clinton, Ohio.

Mrs. George B. Cox, widow of the former Republican

operating twenty-four hours a day since March. As their shipments have covered practically the entire United States, business would seem good in the marble and stone trade everywhere. New York City and territory, through the agency of the Tompkins-Kiel Marble Company, has consumed a very large portion of their output.

The granite firm of Boutwell, Milne & Varnum, of Barre, has just completed a compressor house of granite to shelter their new equipment. This is a two-stage steam-driven air compressor manufactured by the Ingersoll-Rand Company and is the largest one of its kind in New England. This will be used to operate large rock drills that were previously driven by steam.

The United States Marble Company of Rutland, Vt., has opened an office at 101 Park Avenue, New York. Mr. Walter F. See, the former general manager of the company at Rutland, has taken charge of the Chicago sales office.

#### LIMESTONE AND SANDSTONE

It is reported that Pittsburgh parties, representing an eastern steel corporation, have bought a large tract of stone land near Bettsville, in northwestern Seneca County, Ohio. This contains an extensive limestone deposit that is rich in manganese and it is proposed to open a quarry and use the product in the steelmaking industry.

A large stone crushing plant has been established in Geary County, near Junction City, Kansas, and this is now running to full capacity, the product being used for road-building purposes. There is a huge hill of limestone which is steadily being blasted away.

The recently incorporated Seneca Lake Limestone Company, with principle offices at Geneva, New York, is opening a large quarry on the shore of Seneca Lake at Dresden, New York. The quarry property consists of 80 acres, most of which is underlaid with limestone, and the Pennsylvania division of the New York Central Railroad runs through the property.

The Boise Stone Company, with quarries near Boise, Idaho, has had a very active season and has sold considerably more stone than during the entire season of 1915.

The limestone quarry at Rockland, Maine, has a face nearly a mile long and in some places it is 500 feet in height. About 300 men are employed. There is no means of entrance or egress to the pit except by means of the derricks, which hoist and lower about a dozen men at a time.

The Bellevue Quarries Company of Bellevue, Ohio, has purchased 15 acres of stone land adjoining their quarries. The consideration was about \$200 an acre.

The largest piece of stone ever quarried in Monroe County, Indiana, was recently shipped by the National Stone Company of Bloomington to a mill at Bedford, where it is to be turned into a huge column for a business building in New York. The stone in the rough contained 776 cubic feet and weighed about sixty-six tons.

The quarrymen employed in the M. A. Ryan quarry and in the Filkins quarry, near Albion, New York, have struck for an increase in wages of 20c a day. The men were drawing \$2.80 for eight hours.

What will be the highest public school in New York—the Manhattan Trade School for Girls—is being constructed on the northwest corner of Lexington Avenue and Twenty-second Street, from plans of C. B. J. Snyder, architect of the Board of Education. The building will be ten stories high, of limestone, terra cotta and light brick. It will cost about \$483,000. In excavating for the foundation an old river bed was struck, which presents a difficult engineering problem.

In reference to the proposed establishment of limestone grinding plants in Oregon, a writer declares that the largest de-

posits of limestone in the state, so far as known, are in the southern part of the state. "Those in the Willamette Valley or tributary to it, are located as follows: One near Dallas, Polk Co.; another near Marquam, Clackamas Co., and one at Green's Station near Rosenberg. The lowest estimate of the amount in these deposits is about 21,000,000 tons; other estimates multiply that by four."

The George Doyle quarry at Dark Hollow, Ind., which has been idle for about two years, started operations again the past month.

The traveling crane men and hoisting engineers of the Bloomington district went on a strike during the past month, claiming that a union has been formed and that the operators would have to recognize it. There are only three or four men in each plant.

#### Business Brevities

Albany is erecting a statue of General Philip Sheridan, who was born in that city. The contractor had put concrete in place for a portion of the base, but he has been ordered to tear this out and replace it with granite.

As part of a celebration in Salt Lake City a rock drilling contest was held the past month, open to miners from all over the state, and conducted for the state championship. Great blocks of granite were used and the time of drilling was fifteen minutes. The men used steel drills seven-eighths of an inch in diameter and 7½-pound double jack hammers and four-pound single jack hammers.

The stone crushing plant of James H. Prentice, at Englewood, N. J., was blown up with dynamite the past month. The explosion, which wrecked the engine house, was the second within a year and the owner declares that it is "spite work."

The Lexington Granite Company, of Lexington, Ky., has increased its capital stock from \$10,000 to \$25,000.

Cox & Son, of Cheyenne, Wyoming, who had the stone contract on the State capitol, have been awarded the contract for the stone work on the Episcopal cathedral at Laramie.

The Texas Rock Company, of Beaumont, Texas, has increased its capital stock from \$10,000 to \$20,000.

The street commissioner of Lynn, Mass., has awarded a

#### MITTON CHURCH, YORKSHIRE, ENG.

Erected in 1340 of local stone and still used after 600 years of service. From a sketch by Tom Parker Briggs.

contract to John W. Sheehan, of that city, for 5,000 tons of crushed stone for street work.

The John Armstrong Lime and Quarry Company, of Alton, Ill., has filed a notice of dissolution.

Mrs. Jane E. Coulby will erect a \$35,000 mausoleum in Lake View Cemetery, Cleveland. The mausoleum will not be completed for a year.

The plant of the Peter Schmidt Cut Stone Company, at 355 East North Avenue, Milwaukee, occupying nearly an entire block, was destroyed by fire the past month. The plant was two stories high, of frame construction. The officials of the

company say that when they rebuild it will be in a less congested district. The entire equipment of machinery was destroyed.

The Crystal Sand Company is spending from \$30,000 to \$40,000 equipping its big plant near Vineland, N. J., with new machinery to be operated by electric power.

The Lautz-McNeary Marble Company, of Carthage, Mo., has filed a statement showing decrease of its capital stock from \$100,000 to \$2,000.

Fred H. Hirth, of Grand Rapids, Mich., has been awarded the contract for the stone work in the new Browning Hotel, in that city, and for the City Hall at Scottville, Mich. He just completed a contract for cut stone for a church at Yale, Mich.

According to the United States Census there are in this country 45 women engaged as quarry workers and 15 as stone masons.

Mr. Frank P. Maul has purchased the cut stone business of J. A. Riggs, Windsor, Ont., and will conduct it in the future under the name of the Frank P. Maul Company. Mr. Maul was formerly engaged in the cement stone business in Ontario and decided to abandon that field for natural stone.

### Construction Notes

The Wise Granite Company has been awarded the contract for a professional building at 5th and Franklin streets, Richmond, Va. The building will cost \$165,000 and will have about 70 suites of offices.

Crow, Lewis & Wickenhoefer, architects, are making plans for a new church edifice for the Fort George Presbyterian Congregation, at 560 West 185th Street, New York. The church will have accommodations for 700 persons.

The Eighth Regiment Armory building, occupying the block bounded by Park and Madison avenues, Ninety-fourth and Ninety-fifth streets, New York, is to be practically rebuilt next year. Pilcher & Tachau, architects, have been commissioned to make plans for extensive alterations, which, it is estimated, will call for an expenditure of \$280,000.

The Bankers' Realty Investment Company, of Omaha, has closed contracts at Kansas City, Mo., to build an apartment hotel on Linwood Boulevard and the Paseo. It will cost about one million dollars and will be 12 stories high. There will be about 650 living rooms.

J. K. Branch will build a palatial home on Monument Avenue, just opposite the Davis Monument, in Richmond, Va. This will represent an expenditure of between \$400,000 and \$500,000. The plans are by John Russell Pope, of New York. The general style will be Italian.

William Welles Bosworth, architect, is preparing revised plans for a 27-story store and office building on the corner of Church and Dey streets, New York, for the Western Union Company and adjoining their recently completed skyscraper. The proposed structure will cost \$1,000,000. The same architect filed plans last July for a similar addition to the Western Union's building, immediately adjoining on the north.

The Black Rock Bank branch of the Citizens' Commercial Trust Company of Buffalo, has just opened a new building in North Buffalo. The building is of stone, marble and brick.

The School Commissioners of Covington, Ohio, will erect a new high school building in the Homesdale section. The board has available \$190,000 in its building fund.

The Overbrook Baptist Church will erect a new church edifice at Wynnewood Road and Malvern Street, Overbrook, Pa. The new church will be built of granite with limestone trimmings.

Shampan & Shampan have prepared plans for a hotel and cafe to be erected at Archer Street and Sutphin Road, Jamaica,

L. I., for Welz & Zurweck Brewery. It will have a façade in the Spanish style, of brick and limestone.

Work has been started on a new 5-story stone and brick hospital at Sioux City for the Sisters of St. Benedict. The design is by W. L. Steele and the cost of the structure will approximate \$125,000.

The New York Central Railroad expects to complete its new station at Bronxville, by Christmas. The structure will have stone trimming and the interior finish will be of marble and tile.

The Arsenal Theater, at Butler and Main streets, Pittsburgh, is being remodeled. There will be a new marble front and a marble foyer.

John Coldren, of Leavenworth, Kan., has been awarded the contract for the erection of a new Jewish Temple in that city. The building will be of gray brick with stone trimming and will be in the Grecian style of architecture.

The Dominican Order is preparing plans for a college at Providence, R. I. This is expected to cost about \$2,000,000.

The Chamber of Commerce of San Francisco is planning the erection of a three-story building to cost about \$150,000.

The City of Cohoes, N. Y., has voted \$200,000 in bonds for the erection of a new high school.

Astoria, Ore., will let the contract for an \$80,000 high school building, the plans for which are by Whitehouse & Foulhoux, Portland.

State Architect L. F. Pilcher, Albany, has prepared plans for a State Normal and Training School at Potsdam, N. Y. Bids will be received until October 31st.

Denver expects to have a Labor Temple, costing about \$100,000.

The Lake Avenue Baptist Congregation of Rochester, N. Y., will erect a new church, after plans by Fotte, Headly & Carpenter, of that city. It will cost \$110,000.

T. W. Best, of Sedalia, Mo., has prepared plans for a dormitory and dining hall at Boonville, Mo., for Kamper Military Academy. The work will cost about \$100,000.

The Y. M. C. A. of Syracuse will erect a four-story building to cost \$150,000. The plans are by Taylor & Bonta, of that city.

H. J. Latenser & Sons, Lee Building, Omaha, have prepared plans for a \$100,000 high school in that city and for a \$400,000 club house for the Omaha Athletic Club.

The Sea Coast Trust Company, of Asbury Park, will erect a \$100,000 banking building.

The Union Pacific Railroad has had plans prepared for a \$100,000 passenger station at Grand Island, Neb.

The Smithsonian Institution, of Washington, will soon receive bids for a \$100,000 Art Gallery Institute in that city. The plans are by C. A. Platt, 11 East Twenty-fourth Street, New York.

The Illinois Central Railroad is planning a great terminal in Chicago that will cost about \$20,000,000.

The Masons of Sioux City, Iowa, will erect a temple, costing about \$300,000, after plans by Beuttler & Arnold, of that city.

The DeKalb County Court House, at Decatur, Ga., was burned down during the past month. The citizens have already discussed the erection of a new building to cost about \$200,000.

The Commercial Savings and Trust Company, of Akron, Ohio, will erect a ten-story bank and office building. It will have a granite façade in the Grecian Doric style.

### Government Work

The United States Light House Inspector, Tompkinsville, N. Y., will receive bids until October 19th for riprap for the Pamrapo Light Station, Newark Bay.

Bids will be received at the office of the Supervising Archi-

tect, Treasury Department, Washington, until October 16th for the construction of a postoffice at Dickinson, N. D., and until October 31st for the construction of a postoffice at Woodbury, N. J.

Bids will be received at the Watervliet, Watervliet, N. Y., until October 23rd for extensive alterations to the existing structures at the Arsenal and the erection of new buildings.

### Quarry Notes

The France Stone Company has just started operations at its quarry near Kenton, Ohio.

A new stone quarry has just been opened on the Reinbeck farm at the head of James Street, Cape Vincent, N. Y. Blasts are being fired several times daily to open up the larger vein.

Because of the inability to get men to operate its public quarry and crushing plant, the town of Beverley, Mass., has been compelled to purchase its supply of broken stone in the open market.

The Oregon Portland Cement Company has opened up its quarries near Roseburg, Ore., and more than 100 men are employed. The product of the quarry is used at the Oswego plant of the company.

The Rose Stone Company is operating a big quarry and crushing plant, located between Newburg and Marlborough, N. Y. The stone is conveyed from the crushers through tunnels under the West Shore Railroad to the river, where it is shipped by barges.

The Albany Concrete Stone Company is operating an extensive quarry and crushing plant at Kenwood, just below Albany, N. Y.

### Death of a Famous Quarry Master

F. W. Manuelle, head of the well-known firm of A. & F. Manuelle, granite merchants and quarry owners of Aberdeen, Scotland, died recently in London. Although Mr. Manuelle was less than 50 years of age, he was one of the most widely known stone men in the world. His firm has been known in Aberdeen for generations, and did much to build up the great granite industry of Aberdeen. The firm owned and operated the famous Dancing Cairns, Sclattie and Dyce quarries, in the Aberdeen district, and also imported much foreign granite for manufacture in their big plant. They also had connection with granite works in Norway and Guernsey.

### Convention of Marble Dealers

The fall convention of the National Association of Marble Dealers of the United States was held at the Statler Hotel, Detroit, Mich., on September 28 and 29. Almost the entire membership, 70 in number, was present. Important business matters affecting the industry were discussed and settled. The meeting was a success in every way.

### Business Embarrassments

The property of the DeFlesco Gray and Brown Stone Company, of Wilburtha, New Jersey, has been sold under foreclosure proceedings. The property was purchased by John R. Phillips and the plant continues in operation.

The Suburban Builders Material and Supply Co., of New Rochelle, New York, has filed schedules in bankruptcy, showing liabilities of \$7,922 and assets of \$18,841.

The Desrosier crushing plant and quarry in Fairhaven, Mass., has been sold under foreclosure proceedings. Immediately after the sale, attachments were placed on the property and a keeper put in charge by various creditors.

The date for the deposit of stock of the Colorado Yule

Marble Company with the First National Bank of Denver has been extended from Sept. 10 to Oct. 15.

Schedules filed by the John Liddle Cut Stone Company, of 402 East 107th Street, New York, now in bankruptcy, show liabilities of \$95,436, of which \$66,087 are secured, and assets of \$95,828.

Walter Carter, cashier of the Carthage National Bank, Carthage, Mo., has been appointed receiver of the Missouri and Kansas Mausoleum Company. This is the result of a suit in which it is alleged that the mausoleum erected by the defendant in Park Cemetery, Carthage, has never been finished, and in which it is asked that a receiver be appointed to complete the mausoleum and adjust the accounts of the company pertaining to this structure.

Robert L. Cook, of 318 Main Street, Springfield, Mass., has filed a voluntary petition in bankruptcy in Boston with liabilities of \$12,000 and assets of a little more than \$6,000. Mr. Cook has instituted suit for \$15,000 for breach of contract against a company who has a patented material he was handling. The company responded with an attachment for \$15,000 against his accounts and Mr. Cook filed the bankruptcy petition to protect his other creditors.

### Trade Notes

The development of the steam turbine and the high efficiency multi-stage centrifugal pump have gone hand in hand, but up to the present it has not been entirely practicable to reconcile the speeds of the two machines so that each would work at its best efficiency. It was necessary, heretofore, to reduce the speed of the turbine and sacrifice much of its efficiency or else speed up the pump with similar results. To overcome this difficulty the Cameron Steam Pump Works, 11 Broadway, New York, have designed and built a multi-stage centrifugal pump, known as the "B-T" Type. It is claimed by the manufacturers that this pump occupies less space than the ordinary boiler feed pump of this general type, and that it will give a much higher degree of efficiency.

The third number of "Roebing Wire Rope," the technical

wire rope bulletin of John A. Roebing's Sons Company, Trenton, N. J., has been issued. It contains information on Aerial Wire Rope Conveyors (continued); The Right and Wrong Way to Measure Wire Rope; The Oldest Suspension Bridge in America; The Roebing Galvanized Drop-Forged Wire Rope Clip; Wire Rope Practice; Incline Planes; Roebing Wire Rope Slings, and Ready Reference Tables.

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## The Making of Granite Paving Blocks



THE changes that have come about in city life during the past generation and the great increase in urban traffic, both as to amount and as to the weight of individual loads, have given great importance to the study of city paving. Many new methods of paving have been invented, using wood, brick and asphalt in various forms, and all have been given severe trial. The advocates of each different form of paving make the most extravagant claims for their method and material, but actual trial has endorsed few of these claims. There is noted in most cities that have given a close study to the subject a strong tendency to revert to the granite block paving, which antedates most of the patented processes. It has always been conceded that granite block paving is one of the most economical that can be used by any municipality because of its great durability. In addition, it furnishes the surest foothold for horses that have to haul heavy loads. The only objection ever urged against it was that it was noisy and that the blocks were apt to become rounded after long use. It has been found, however, that both of these objections can be overcome by greater care in the cutting and laying of the blocks. If the blocks are made of smaller size than were formerly used, are so carefully cut that they can be laid with close joints and are then set on a firm foundation and carefully grouted, it is found that they do not become rounded on the surface and that they are as noiseless as any durable pavement.

An interesting account of the making of granite blocks is given in an exchange. Few persons who travel over the smooth granite paving of the present time, says the writer, realize that the blocks from which the surface is made are hewn out of the quarries by hand or "broken out" in the quarryman's vernacular. From the time the huge block of granite is dynamited from the main body of the stone in the quarry until it is placed on the paving base in the street hand work plays a large part in the manufacture of these blocks.

The smooth, grouted granite block paving is being used more extensively than ever on streets where the traffic is heavy, replacing the rough blocks which are

found to a large extent on streets paved some years ago.

Whether smooth or rough the granite block is "split." It appears that the split granite paving blocks were introduced into the United States in Boston by Solomon Willard in 1840. Since then millions of these blocks in various sizes have been laid in all sections of the United States. New England has always been the chief producing section, and it is estimated that 35,000,000 blocks will be cut in the New England States alone during the present year.

The first process in the manufacture of the granite paving blocks is the blasting of huge slabs of granite from the main body of rock. Automatic air-compressor drills are used to bore the holes in the rock and dynamite is utilized in the actual loosening of the slabs. It is necessary for the larger slabs to be broken into sizes which one man can handle, and this is done by a second use of the air-compressor drills.

The next step in the process involves the removal of the small slabs from the quarry to the paving cutter. Huge derricks lift these small slabs from the pit of the quarry onto small flat cars by which they are hauled to the paving cutters' yard by a steam engine over narrow gauge rails. The platforms of the cars are so adjusted with automatic drops that either side may be lowered, thus allowing the blocks or "lifts" to slide directly from the platform of the car into the "cutters' yard."

The "first break" is made in the cutters' yard. Through years of experience the cutters have learned that granite splits more easily in two planes than in any other directions. These two planes are known as the "rift" and the "grain." Blocks split easier along the rift, but the ordinary person can detect neither the rift nor the grain, but to the experienced cutter their detection comes as a matter of course.

Holes are drilled in the block at regular intervals. The cutter then makes his first break by means of "p'ug and feather splitting." In the drill holes, which extend nearly through the block or "lift," are placed steel plates, called "feathers," to protect the sides of the drill holes. Between the feathers, steel wedges or plugs



are driven along the whole line with a sledge hammer as nearly simultaneously as possible. In this way the blocks are split in the first break.

The second split is made by means of a "bull wedge." The air compressor is used to drill shallow holes in the block. The "bull wedge" is a small steel wedge which is inserted into the shallow drill hole in the top of the block. One blow of the cutter's hammer on this "bull wedge" instantly splits the block into two parts.

Each one of the two parts of the block after the splitting by the "bull wedge" is ready for the final split. In making the final split, no machinery is used. It is done entirely with a chisel and hammer. A shallow channel is hammered with the chisel entirely across the block to be split. The block is then turned over and struck a hard blow on the opposite side exactly in the center of the channel made with the chisel, and the block splits into two sections. These two sections furnish the smooth, granite blocks now finding so extensive a use for street paving.

### **Lafayette Monument in Brooklyn**

The principal feature of the Lafayette Monument which is to be erected at the Ninth Street entrance to Prospect Park, Brooklyn, will be a bronze relief by Daniel Chester French. The plaster model for the relief, which Mr. French fashioned at his studio in Sockbridge, has been approved by the Municipal Art Commission and the work of casting it in bronze now is under way. Delay in getting moulding sand from France has caused a postponement of the unveiling until early next year.

The Lafayette Monument is a gift from the late Henry Harteau, who left a fund of \$35,000 to the city of Brooklyn for this purpose. Lafayette stands out in bold relief in the center of the tablet, and in the background stands his charger, held by an orderly. Lafayette wears the uniform of a general in the Continental Army. His drawn sword is in his right hand, and his left hand is placed upon his hip. The three figures, those of Lafayette, his orderly and his horse, are on the heroic scale and are shown at full-length. The relief is nine feet high and eleven feet wide. It is of about the same shape and size as the Saint-Gaudens relief of Shaw and his negro troops in Boston. The sculptor has been at work on it for about a year and a half.

The completed Lafayette Monument will include a granite bench or exedra on each side of the relief, and also a few minor members to round out and balance the design. The cost of the monument will be \$35,000.

### **Gigantic Statue in Granite**

Mrs. Harry Payne Whitney, who designed the gigantic figure that is to stand in Potomac Park, Washington, as a memorial to the Titanic victims, has formally approved the statue as cut. The figure is of

heroic size and was fashioned by John Horrigan, a Quincy sculptor from a single block of Westerly granite, quarried in Rhode Island by the H. G. Smalley Co. It was originally intended to have the figure executed in Paris, France, in two pieces, but the outbreak of the war forced the abandonment of those plans.

The figure is suggestive of sacrifice, the upturned face symbolizes the resignation of the men to their fate, the pose of the body on tip-toe expresses the final plunge into Eternity. The dimensions of the statue are 12 feet, 6 inches from tip to tip of fingers, and 13 feet high. The figure is decidedly that of a man.

The pedestal is not yet executed, but will be 12 feet square at the base and ten feet high, giving the monument a total height, when erected, of 23 feet. Work on that section is not to be started until the national government formally donates the site.

The figure has a hammered finish and was completed several months ago. Mrs. Whitney said that at one time she gave up all hopes of seeing the monstrous figure hewn from one block of granite and that the French contract called for two separately executed parts that would be joined under the shoulders. "If it hadn't been for the war," she declared, "one of the finest memorials in this country would have been produced on foreign shores."

Plans for shipping the memorial have not been completed, but it will probably go by rail. The Pennsylvania Railroad has offered to construct a special car with a drop bottom so that one of the arms will be lower than the figure and assure a safe passage under railroad bridges en route.

### **City Crushing Plant in Ruins**

The Haverhill, Mass., papers declare that the municipal crushing plant at Rosemont, near that city, which cost \$10,000 a few years ago, and which would probably cost \$12,000 to duplicate now, is rapidly becoming junk. The writers charge that the property has been left absolutely without care or protection, that the doors and windows of the buildings have been destroyed, that parts of the machinery have been carried off by vandals, and that what is left is almost eaten up with rust. They estimate that the entire plant would not bring \$1,000 now, for removal.

### **Water-Worn Stones for a Villa**

Besides being out of the ordinary in style of architecture, the new home of Harry Levy, being erected at East Walnut Hills, near Cincinnati, Ohio, will have a novelty in the type of stone being used. The stone selected is taken from the beds of local creeks and other water courses and is said to be particularly desirable for facing and other work where the natural beauty of its lines stand out. Its rough surface is said to lend an old English effect such as no other stone will produce. The new residence is to cost \$50,000.

## The Marbles of Alaska



ACCORDING to a report of the United States Geological Survey, the development of the marble industry in Alaska during 1915 was in a fairly satisfactory condition. The figures of production are not helpful, because marble, gypsum and petroleum are classed together in order not to reveal the production of individual properties. The total value of the output in this group was \$272,299 in 1915, an increase of \$110,057 over the previous year. The marble quarry of the Vermont Marble Company, at Token, was operated as usual. This company has recently opened a quarry on claims bonded from Woodbridge & Lowery. The new camp, known as Skyrus, is on the west shore of Red Bay, on the north end of Prince of Wales Island.

Interest in the development of marble properties continues, especially in the Ketchikan district. The Alaska Marble Company did considerable development work on its claims at Calder, also some prospecting on Dry Pass, with satisfactory results. Marble prospecting has been continued at other places on Dall Island and Revillagigedo Island, and some commercial marble of very good grade has been located. These marble deposits will be described in more detail in a forthcoming bulletin. Assessment work is being continued by Lhote, Ickis and others on marble deposits near the head of Waterfall Bay, on the west coast of Dall Island. The property comprises 20 claims, including

the Eurys, Marble Heart, St. Augustine and Marble Bay groups. The claims are on the steep hillside only a short distance from the head of the bay.

Sections are given of the marble deposits on Waterfall Bay, and it is said that the finest marble in this section is a 13-foot bed of "pink-mottled" white marble. The upper and lower parts of the bed are even-textured, medium to fine-grained white marble, mottled with a very delicate pink tint and veined with irregular threadlike veinlets of yellow. In the central part of the bed the pink color is more pronounced and the rock contains much white mica, a combination that produces a handsome rock. A short distance beyond this point are beds of white pink marble with mottled green areas. These are very handsome and are susceptible of a high polish except where the green minerals predominate. The greater part of the bed is white and pink marble, composed of nearly pure calcite of very fine grain, the individual minerals averaging about 0.05 millimeter in diameter. The base and top of the bed are variegated with green areas which, combined with the pink-mottled white rock, give a very striking effect. Under the microscope the green areas are seen to be sericite, quartz and chlorite; the white and pink rock is essentially calcite. The thick mass of bluish-gray marble at the top of the measured sections contains beds of ornamental marble of commercial value. These beds are black and white, mottled in very

DESHONG MEMORIAL ART MUSEUM AT CHESTER, PA.

Copyright by Wurtz Bros.

Architects: Clarence W. Brazer and E. Donald Robb, New York. Built of white marble from the quarries of the South Dover Marble Company, Wingdale, N. Y. Cut by B. A. & G. N. Williams, New York.

intricate pattern, and bluish white, with black veinlets. This rock takes a smooth polish. Marble crops out at several places along the south shore of the bay between the cabin and the greenstone contact. Near the cabin an opening has been made on a bed of fine-grained, even-textured white marble carrying flakes of white mica. Another commercial marble on this bay is a fine-grained black variety that takes a good polish. The polished surface shows a black field with white-mottled areas and irregular veinlets of white calcite that give it a pleasing appearance.

Marble deposits occur at a number of places on the east coast of Dall Island. Near the head of View Cove a stream that enters from the southwest flows in a gorge following joint planes in the marble. This stream was traversed from the beach for half a mile, and for that distance the beds strike about northwest, directly across the course of the stream, and stand nearly vertical. Most of the marble seen is a pearl to gray in color, mottled and veined in white. At one locality occurs a 4-foot band of yellow marble with a green stripe, and bordering it is white marble, mottled with yellow. The yellow marble takes a good polish and has a warm, soft tone. Associated with these beds is a little bluish-black marble. A polished specimen shows a black field variegated with dark-gray areas and tiny veinlets of white calcite.

Marble was also noted on the northeast side of Coco Harbor, half a mile from the head. Where it crops out along the beach it is evidently faulted against gray limestone. Back from the beach the out-crops are too few to determine its relations accurately. The marble is white to gray. Much of it is very fine grained and pure white, and some parts are coarsely crystalline, with large flashing crystals of calcite. Pyrite is not abundant but was noted in places as veinlets and disseminated particles. Marble claims are held at a number of other localities on Dall Island, but they were not visited in 1915.

Deposits of marble have recently been located near the northwest end of Long Island, 3 to 4 miles north of Howkan, on two small bays known locally as Waters and Gotsongni bays. At this locality the brush is very thick along the shore and outcrops are few, making prospecting difficult, but the physical conditions favor the exploitation of the deposits. The shore of the island rises abruptly from the beach, the timber is plentiful and of an exceptionally good grade, and the deposits occur on sheltered harbors which afford easy access to boats.

On Waters Bay three claims, the Lily, Long Island, and White Cloud, have been located, and assessment work has been done on them. Most of the marble exposed has a bluish-white field with white-mottled areas and blue-black stripes. Under the microscope the rock is seen to be composed essentially of twinned calcite crystals ranging in size from 0.25 to 0.7 millimeter, inclosed in a network of finely granular calcite

averaging about 0.05 millimeter in diameter and forming with the large calcite crystals an intersectal fabric. The large calcite crystals are bent and fractured. They are evidently crushed fragments around which the fine-grained calcite has recrystallized. The black stripes are composed of opaque particles of carbonaceous material, probably graphite. Associated with the striped marble are beds of medium-grained white marble of even texture and also beds of blue-clouded white marble with yellow patches. This rock takes an excellent polish.

On Gotsongni Bay marble occurs on the east shore, three-quarters of a mile from the head. On the beach are outcrops of coarse-grained, even-textured white marble. A short distance back from the beach and separated from the white marble by a brush-concealed area is a large body of bluish-white marble with black stripes. The rock is medium grained and even textured. It takes a good polish and is apparently free from quartz.

A deposit of white marble is being developed near Carroll Inlet by G. E. Dickinson and B. Bell. The claims are located on Marble Creek, a stream entering a cove on Carroll Inlet from the east about 10 miles from its head. From this cove a trail leads to the claims, a distance of about 1½ miles. The rock is exposed by surface cuts at several places and along Marble Creek for half a mile, the width covered by the claim locations. For this distance the rock shows little variation. It consists of white crystalline marble of even texture and of very fine grade. No analysis was made of the rock, but to judge from its slight effervescence with acid it is probably dolomite.

### Granite Quarry to be Opened Near the National Capital

Announcement is made that the National Capital is to have a new enterprise, nothing less than a quarry, almost at its very doors, producing building and monument granite. The quarry is at Bethesda, Md., not six miles from the heart of Washington, and is being operated by the Bethesda Blue Granite Company, of which Allan E. Walker, of Washington, is president and general manager. The property is about a mile and a half from Tenallytown, on the River road, and on the Baltimore & Ohio Railroad spur from Georgetown. It consists of about 50 acres, and practically all of the land is underlain with granite. The stone is fine grained, blue in color, takes a high polish, has a low ratio of absorption and high tensile and crushing strength. There has already arisen a considerable demand for the waste stone for foundation rubble. Orders have been placed for polishing and finishing machinery, and the mill will be placed so that the stone can be handled by gravity alone from the quarry to the mill and thence to the railroad for shipment. About 20 men are now employed at the quarry.

### Carved Stonework for St. Louis Cathedral

Four or five years ago we gave several illustrations in these columns of the new reredos in Christ Church Episcopal Cathedral at St. Louis, executed by the late Harry Hems, Exeter, England. This was the most important Gothic church work of its kind erected since medieval days. The reredos is over 33 feet high and 30 feet wide. The commission for the work was given to the English sculptor because of his success in restoring ancient church work, fine examples from his studio being found in many lands. The *motif* for the St. Louis work was found in the High Altar Screen at St. Albans Abbey, England, and in the reredos of Winchester Cathedral, both recognized as among the finest examples of Gothic stone work. The reredos was carved in Mr. Hems' Exeter studio and was erected in the Cathedral by the sculptor under the direct supervision of the architects in charge of the restoration, Messrs. Tully & Clark, St. Louis. It was executed entirely in Caen stone. The work complete weighed about 160 tons. A fitting companion piece to this has just been completed and erected in the St. Louis Cathedral in the form of a canopy over the Bishop's Throne, which we are illustrating herewith. The job was cut in Caen stone in St. Louis, under contract, by Christopher Seale, sculptor and modeler, of 1132 East 44th Street, Chicago. It is 10 feet, 6 inches in height and 10 feet in width and the canopy is of the same architectural style as the reredos by Mr. Hems. It is the gift of Mr. A. Howard, of St. Louis. It is a matter for congratulation that the American churches are introducing artistic stone work of this nature that will compare favorably with the best work in any European country.

### Demand the Best

If you are building or about to do so, consider well the question of the roof, says an English exchange. Bear in mind above all, that a good roofing material must withstand not only rain but snow, frost, the fumes of acids, smoke and gases. It should resist decomposition, and it must be laid in such a way as to leave no holes nor cracks for water to enter. It must be durable and should need next to no attention

after it has once been laid. No painting or cementing should be needed to make it strong and watertight, and practically, the first cost should be the last. It will pay you well to think, and think hard, about your roofing material. Accept no imitations, take only the genuine article.

### A Tremendous Slide of Granite

Over 5,000 tons of granite and debris were dislodged by a landslide at Scattie Quarry, near Aberdeen, the other day. Fortunately blasting operations were in progress at the time, and the employees were not in the quarry when the mass of material was precipitated 250 feet to the bottom, so no one was injured. The few who were engaged in the blasting operations were in a safe position.

#### CANOPY FOR BISHOP'S THRONE, ST. LOUIS CATHEDRAL

Designed by James P. Jamieson, architect, Security Building, St. Louis. Cut in Caen stone by Christopher Seale, Chicago, Ill. The gift of Mrs. Howard, of St. Louis.

### Bedford Stone Club Auxiliary

A number of the leading firms in the Indiana limestone district have formed the Bedford Stone Club Auxiliary, for the purpose of promoting the use of Indiana limestone and to improve conditions within the industry. The following are the members of the association: Bedford Cut Stone Company, Bedford Steam Stone Works, Bedford Stone & Construction Company, Brooks Cut Stone Company, Consolidated Stone Company, J. P. Falt Company, Furst-Kerber Cut Stone Company, Hoosier Cut Stone Company, Ingalls Stone Company, Indiana-Bedford Stone Company, John A. Rowe Cut Stone Company, Shea, Donnelly & Giberson Company, Henry Struble Cut Stone Company, of Bedford, and the Central Oolitic Stone Company, Hoadley Stone Company, Matthews Bros. Company, and South Side Stone Company, of Bloomington.

One of the main objects of the association is to protect its members against unfair trade methods and the giving out of erroneous statements as to bids and estimates which have been submitted by them. To accomplish this purpose they have adopted the following rules:

1. Where general bids are taken by the owners or architects of building projects and a specific date set for the opening of same, duplicate proposals on limestone are automatically opened two days in advance thereof by the Secretary of the Association. In this manner the low bidder on limestone work is ascertained so far as members of this organization are concerned.

2. In the event that a general contractor has been selected by an owner or architect to do the work on a percentage basis or otherwise, and limestone bids are solicited from the firms named below, it is necessary that a date be set to take such bids or a declaration be made to the effect that no bids will be taken on stone work after a specific date. In like manner, as in the opening of general bids by architects, duplicate proposals are automatically opened by the Secretary of the Association two days prior to such date set by the general contractor.

3. Plans and specifications should be submitted to all members of this association from whom bids are desired in ample time to permit the filing of proposals with the secretary of the association in accordance with the foregoing rule.

All bids from members of this association must be obtained in compliance with these rules, as members of the association have found that this is the only way in which they are able to protect themselves against unfair competition. This association is in no way interested in the date to be set by the general contractor for taking limestone bids, but in order to prevent the use of an estimate furnished by one member to the detriment of other members, the association has found

it necessary to insist that some specific date be set for the above purpose in order that the best interests of all concerned may be served.

### The Function of Lime in Agriculture

Lime is a great deal more than a corrective of acidity in the soil, says an Oregon exchange.

One need but turn to the bulletins of the state agricultural college to learn that lime not only corrects the acidity of the land but plays another and most useful part in the economy of nature. It helps set free the nutritive elements which are locked up in the soil. In this way it makes available stores of wealth which can not be reached by any other practicable means.


This is the reason why lime is so valuable on soils which are mistakenly said to be exhausted. Modern research demonstrates that there is hardly any such thing as an exhausted soil. The elements essential to plant growth are commonly present even in land which has been most ruthlessly plundered of its fertility, but they are not in shape for the rootlets to utilize. They are combined with other substances and thus withheld from the action of the life force. Lime acts in an amazingly providential manner to release these imprisoned elements and render them useful to the growing plant.

It thus happens that lime is frequently very useful on land which is not acid. We owe our knowledge of these important truths to the agricultural college bulletins and similar publications where lime is spoken of as an "indirect fertilizer." It does not itself contribute much to the growth of vegetation, but it renders other elements available for that purpose.

### Matching Granite in an Old Building

The old National Bank Building at Spokane, Wash., is being enlarged and remodelled to accommodate the Union Trust and Savings Bank. It is desired to keep everything in harmony with the existing work, so that unusual precautions are being made. A portion of the iron grill has been shipped to Chicago in order that it may be copied, as the original maker went into bankruptcy and the patterns were lost. In the same way a section of the mahogany desks used by the officers was shipped to Milwaukee so that the color grain and finish could be matched. Additional granite will be needed for the exterior. It was impossible to send a sample of the granite used to the quarries in Barre, Vt., where the granite originally was cut. The process has been reversed and the Barre firm is sending samples to Spokane to be matched with the existing base. From the sample that matches, the new granite blocks will be cut and shipped to Spokane. The work of remodelling is being done under the direction of Graham, Burnham & Co., of Chicago, who designed the original building.

## Quarrying Limestone

 HE quarrying of limestone for structural purposes is conducted in this country according to the same methods that are followed in the quarrying of marble. The blocks are cut by means of channeling machines. The great limestone quarries in the Indiana district, which furnish most of the building limestone used in this country, are very elaborately equipped and represent the fullest development of quarrying enterprise. During the past few years, however, there has arisen a general demand for ground limestone to be used for agricultural purposes. This has meant the opening and development of quarries in many sections of the country that are new to this line of enterprise, and they are often conducted by men who have had little previous experience in the extraction of stone. In this case the object is to get out the largest amount of stone at the least possible cost and to have the product in such condition that it readily lends itself to crushing and grinding. An excellent article on the methods to be followed in quarries of this kind appears in the latest report of the Geological Survey of Georgia, which is devoted to the Limestones and Marls of the Coastal Plain of Georgia. This is written by Mr. J. E. Brantly, Assistant State Geologist. Mr. Brantly says:

"Quarrying is the first and one of the most important steps in the production of limestone and its products, and yet very little has been published on and apparently little study given the operation. Practically every deposit of limestone is governed by certain local conditions and is a problem within itself, hence few general statements can be made which cover the work as a whole. Only one general method need be dwelled upon to any extent, namely, quarrying. It is sometimes necessary to resort to underground mining, but this is so expensive compared to the value of the limestone product that it need be considered only lightly.

"There are two general types of quarries, the hillside type and the pit or open cut quarry. It is seldom that the operator has the opportunity to choose which of the two methods to work a given deposit by; usually the limestone body is so situated that only one type quarry can be opened. If the operator can make a choice, however, he should work the deposit as a hillside quarry, since they are practically always cheaper to operate than pits. In the latter there is the extra expense of lifting the stone from the floor of the quarry to the top of the face and the removal of water from the working. The other costs are

practically the same as for hillside quarries.

"The site for the workings should be chosen with regard to (1) overburden, (2) strike and dip of the strata, (3) drainage, (4) haulage grade to mill or kilns, (5) mill or kiln site, and (6) transportation. These factors are not arranged according to their importance, which is governed by the local conditions. The demand and composition of the stone are not taken into consideration, as it is supposed these are known.

"The overburden or superincumbent material on the limestone governs to a great extent the workability of a given deposit. It is obvious that a great thickness of valueless material cannot be moved for a comparatively thin bed of limestone on an economic basis. Hence, it is necessary to locate the quarry where a minimum amount of overburden will have to be moved. The maximum thickness that can be handled is governed by the workable thickness of the underlying limestone.

"When limestone outcrops along the base or side of a hill it is evident that the farther the workings are extended into the hill the heavier the overburden. Under these conditions it is usually practicable to move a greater maximum thickness of overburden than from a deposit under level ground, since on the hillside deposit the mean thickness is less than the maximum. Where the conditions are suitable it is more economical to 'edge' the hill than to work straight in for any distance.

"In the hillside quarry the floor should be always kept above the drainage level, if possible, to avoid the necessity of removing such water as might accumulate from seepage, rain or flood stages of a nearby stream. In a pit quarry it is, of course, impossible that the quarry be so situated that it will have natural drainage except where tunnels can be employed.

"An important item in the cost of quarrying is the hauling of the broken stone from the quarry to the mill. It follows, therefore, that it is expedient to put

### COLLAPSE OF CONCRETE RESERVOIR WALL AT MADISON, WIS.

The structure, built nine or ten years ago, broke down, despite the reinforcement, when repairs were to be made.

the mill as close to the quarry as possible without it being in danger from blasting. If the conditions make it possible the haulage cost can be greatly reduced by working the deposit at such an elevation that the tram cars will run by gravity to the mill, preferably to the feed bin of the crusher or the top of the lime kiln, as the case may be.

"The site for the plant is governed by the location of the quarry and possible location for the spur track from the main line of the railroad. Railroad construction is rather expensive, hence the necessity of locating the workings as near the main line as possible. This expense is usually partially borne by the railroads under certain conditions.

"Stripping or removing the overburden from a deposit of limestone may be done by one or more of a number of different methods, namely, pick, shovel and wheelbarrow, plow and scrapers, hydraulic giant or steam shovel. There are other implements and machines in use, but those named are the most generally used, especially where the development work is rather limited. The material to be moved governs to a great extent the methods to be used. The deposits that this report deals with, however, are covered usually with sand, sandy clay or clay with sometimes flint boulders, so that any one of the above methods can be applied.

"The most expensive method of excavating and removing overburden is by pick, shovel and wheelbarrow or wagon. These tools can only be applied economically where the overburden is very thin or the conditions such that other implements cannot be employed.

"The plow and scraper are probably the most efficient implements that can be employed on account of their adaptability and comparatively cheap operative cost. While costing more per yard to move the dirt than by other mechanical means the outlay of capital is comparatively small. The plow is necessary to loosen the earth before the scraper can be filled. Of the two types of scrapers the drag scraper is more suitable for close work and short hauls, and the wheel scraper for open work and long hauls. The latter should be used whenever possible, since it has a larger capacity than the former, and being on wheels is much easier on the team. v

"A hydraulic giant is a large, flexible water nozzle through which water is forced at high pressure and played upon the bank of material to be moved. The dirt is thus washed off of the underlying deposit. It is, of course, necessary to have an ample supply of water close at hand if the hydraulic giant is to be used. This is a comparatively cheap method, but the outlay necessary to install adequate pumping machinery is rather large.

"The cheapest means of excavating the overburden, provided it is heavy, is by the steam shovel. A steam shovel can operate most efficiently in loose material sufficiently thick to allow the shovel to be in the dirt

from the lower to practically the upper limit of its stroke. But where the overburden is of such a thickness, say 15 feet, it usually will not pay to move it for the underlying limestone."

Mr. Brantly then describes the different methods and appliances for drilling stone, and with regard to blasting he says:

"The powder or dynamite to be used in quarrying depends upon the hardness and toughness of the stone and the products to be made. A hard stone is more easily worked by dynamite, while a very soft one can be more satisfactorily broken with black powder. The percentage of dynamite and the grade of powder can best be determined by experience. Where crushed stone or agricultural limestone is the product the size of quarried rock may be practically any size that can be efficiently handled by the crushing machinery. When lime is the final product it is desirable to have as much of the stone as possible above a minimum size to prevent choking the furnace and below a maximum to assure thorough calcination."

### Why the Slate Trade Lags

The causes which have contributed to the depression in the slate trade in the United States during 1915 are suggested by a report recently published by the Geological Survey. This states that there was a general lack of demand attributed by the producers to inactivity in building operations, which extended throughout the country until late summer or early fall. Prices were not steady. Some companies, with large stocks on hand, sold their products at lower prices than have prevailed for ten years; and several companies, unable to withstand the severe competition and the increasing cost of labor and supplies, suspended operations. A few companies were affected by purely local conditions possible in any year, such as falls of rock and inadequate equipment.

For several years slate has suffered from competition with artificial roofing materials, which have been aggressively advertised, and from the increasing number of factories, dwellings, schools and other buildings that have been built with flat roofs. Some slate producers complain that there is a general apathy on the part of slate companies in meeting these conditions; that inadequate advertising of slate is largely responsible for the inroads made by well-advertised artificial materials; and that the failure of companies to cooperate in promoting its development has allowed the slate industry to remain nearly stationary or to decline, while other competing industries have made substantial progress.

It has also been suggested that a failure to recognize a certain minimum thickness for slates has been unfavorable to the industry; that some producers are in the habit of splitting their slates too thin, and that the insistence by architects and the general public on

thicker slates would result in much less breakage, a higher standard of splitting and sorting slates, and the marketing of a product of higher grade. The minimum thickness suggested is three-sixteenths of an inch for the strongest slates and fully a quarter of an inch for the common slates of somewhat less strength. The growing demand for thicker slates to produce rough effects should assist in this development of the industry.

### Water Shipments for Quincy

The granite manufacturers of Quincy are very enthusiastic over the plan, recommended by the Massachusetts Waterways Board, and approved by the Governor and Council, for the improvement of Hayward's Creek, now a marshy, useless body of water, so as to make Quincy a deep water port, thus opening up new shipping facilities to the South Shore. While it is said that the greatest advantages of this improvement would accrue to Quincy and Braintree, it means a deep water outlet for approximately 800 industrial concerns, in which more than \$84,000,000 of capital is invested and finished products of more than \$120,000,000 are yearly turned out. The Quincy quarrymen and granite manufacturers have always complained bitterly of the lack of shipping facilities. Not only do they find it impossible to railroad extensions to the quarries, but when they haul their product to the depots, there is not sufficient derrick equipment to handle it.

### Plans for the Colorado-Yule

Two plans have been presented for the organization of the Colorado-Yule Marble Company. The Western reorganization committee, of which Mortimer Matthews, of Denver, is chairman, proposes to cut down the capitalization from \$12,500,000 to \$4,221,475. An Eastern committee, of which B. N. Griffing is chairman, and which represents the Charles Austin Bates interests, would issue profit-sharing bonds and make no substantial reduction in the capitalization.

"As receiver for the company I am not in a position to take sides with either of these committees, but must remain neutral," said J. F. Manning, receiver for the company. "I hope that the committees will get together and adopt a satisfactory plan of adjustment so the company can go ahead. I am confident that it will take only a short time for the output of the company to reach \$1,000,000 per year gross, with a net saving to the stockholders of 25

per cent., and that ultimately this gross will be raised to \$2,500,000 and make of the company one of the biggest industries in the state."

Mr. Manning said that it was proposed to raise \$1,000,000 working capital. Additional equipment and power to cost \$250,000 will be installed, he said, to balance up the plant so that the quarry output can be increased to an excess of the capacity of the finishing mills.

### Tree Growing on a Stone Tower

On the southwest corner of the top of the tower of St. Peter's Catholic Church, at Greenfield, Mass., what appears to be a small poplar tree is religiously growing, planted there probably by some flying seed. A number of people have noticed the curiosity, which is not likely to long remain, in view of the fact that the roots of a tree of any size would be likely to loosen some of the top stones on the white marble tower.

### The Importance of the Roof Would Indicate Natural Covering

The most important part of the building is the roof, says the *Slate Trade Gazette*. It protects the whole fabric and the interior decorations, fittings, etc., and, last but not least, protects the health of the occupants. It is therefore absolutely essential that the building must be covered with the best materials, and the work carried through by competent workmen. In deciding on the question of materials the market offers us several kinds, but in selecting the best we turn to the ones provided by nature.

LARGEST BLOCK OF GRANITE EVER BROKEN LOOSE AT QUINCY  
The block, quarried by Edward H. Geddes, is 72 feet wide at one end, 22 feet at the other, 200 feet long and 15 feet thick.



## A Unique Quarry Railroad

**A** QUARRY railroad that has some unique features has just been installed by the Lidgerwood Manufacturing Company, of New York, for the American Carrara Marble Company, at Carrara, in Southwestern Nevada, near the California line. The property is located on the Las Vegas & Tonopah and the Tonopah & Tidewater railroads. The quarries are about three miles from Carrara, while the company's offices and the dwellings for the employees are all located in Carrara. The problem of bringing the marble from the quarry to the railroad and the transportation of the employees was perplexing, because of the fact that the difference in elevation between the two points was more than a locomotive could negotiate unless a system of switchbacks was used, which would make the cost of such an installation prohibitive.

The railway which has been installed consists of a straight line incline, 15,945 feet long, the difference in elevation between the upper and lower terminals being 1,266 feet. The total length of car travel between terminals is 14,780 feet, the average grade of the line is 8.54%, the maximum grade at the top  $13\frac{1}{2}\%$ , and the grade at the bottom 2.13%. The tracks consist of a three-rail arrangement from the upper terminal to the center, with a four-rail turnout and a two-rail arrangement from the turnout to the lower terminal. The gauge is 40", the rails 56 pounds, the length of the turnout approximately 150 feet, and the switch connecting the turnout with the lower section of track is automatic in its action so that the descending car will open same and it will remain in this position until the same car has passed on its up trip, when the descending car on the opposite side of the turnout will throw the switch to the opposite direction. The three-rail track arrangement at the upper terminal is fitted with a unique arrangement of frogs and switches, whereby the spur leading to the quarry likewise consists of three rails in order that there may be no necessity of having the cars cross from one side to the other while being brought to the upper terminal. The cars from the quarry are brought to the upper terminal by means of a Lidgerwood Single Friction Drum Electric Hoist. The difference in elevation of the upper terminal and the quarry floor is such that the empty cars will descend to the quarry by gravity,

and the loaded cars are pulled out by means of the electric hoist.

The rope is supported on the track by 750 Lidgerwood improved rope supporting rollers, which are self-lubricating and are carried in a one-piece frame to insure absolute alignment and positive turning of the rollers at all times. These rollers are made of cast iron and are large in diameter.

The cars are made up specially to suit the conditions and are built up of structural steel, platforms being 5 feet wide by 16 feet long, and are mounted on two 4-wheel swiveling trucks with 24" wheels. The cars are fitted with hand brakes, which are only used, however, when the cars are in the quarry or at the finishing plant at the foot of the incline. Sufficient track room has been provided at both terminals so that two cars may be coupled together for transporting unusual lengths of marble. Each car is designed for a load of 50,000 pounds. The rope is in one piece, 16,000 feet long, 1 inch in diameter.

Alternating current for operating the hoists is supplied from Rhyolite, and is furnished by the Nevada California Power Company. The hoist motor and the control equipment is such that when lowering the marble the motor automatically becomes a generator

### ELECTRIC HOIST FOR A QUARRY RAILROAD

Part of a Lidgerwood installation for a unique equipment in a Western marble quarry.

and returns current to the line while it is being overhauled by the descending car. This arrangement dispenses with the necessity of any mechanical braking, provides for absolute safety and a uniform car speed throughout the entire trip. There are included automatic electric brakes which will stop the cars in case of failure of the power supply, also positive overwinding devices to bring the cars to rest at the terminals in case the operator should fail to do so. The

hoist for controlling the cars is built by the Lidgerwood Manufacturing Company and was designed for operating under the following conditions:

For lowering a loaded car with an empty car ascending, or for hoisting a maximum load of 3 tons with an empty car descending. Uniform rope speed—700 FPM. Current to the motor—3-phase, 60-cycle, 440-volts, alternating.

The hoist is of the double drum endless rope type fitted with slip rings, drums being arranged tan-

is of heavy duty pattern. There is also provided an oil switch with overload and low voltage protection. The rope is led from the cars to the hoist over a system of large sheaves. When the loaded cars are detached at the lower terminal they are taken to the finishing plant by means of a storage battery locomotive.

The reason for using three rails above the turnout was to eliminate complications respecting the rope. If a two-rail track were used above the turnout it would necessitate cutting the rails where the ropes cross the same, so that the wheels of the descending car would not cut the rope of the ascending car. Another reason for using three rails instead of two is that it eliminates the need for an attendant to throw a switch. Such a switch would be necessary in case two rails only were used. It might, of course, be possible to devise an automatic switch which would be thrown by the car passing over it, but this has not been done as yet and it would not be a very safe proposition.

### The Virginia Onyx Belt

Marshall Haney, a consulting mining engineer of Ceer, Green County, Virginia, has written an interesting article on the deposits of onyx that are found in the Valley of Virginia. Mr. Haney says that most of the onyx used in the United States is obtained from Mexico, though small quantities are obtained from Egypt and North Algeria.

Onyx is found in several counties in Virginia, but the most extensive and promising beds are located in the western part of Rockingham County, near the C & W. R. R. track, and extend from near Dayton to Spring Creek, a distance of about eight miles, says Mr. Haney. At several points the beds are exposed by old development work. About one and one-half miles west of Dayton considerable development was carried on about forty years ago which exposes several good beds of highly transparent and delicately tinted and banded stones. The orange banding and high polish this stone takes make it very valuable. The best property in quality and quantity in this belt is located on Round Hill, about one mile west of Bridgewater. The property has several beds of richly and finely banded and colored stone, and some small specimens taken from near the surface, when sawed into one inch slabs, commanded a price of \$50.00 per square foot.

Another deposit located about one-half mile from Spring Creek has a considerable bed of stone exposed and a good deal of quarrying was carried on at this place some fifty years ago, and it is reported that a considerable quantity of stone was shipped to New York City.

Several samples of this stone can be seen in the collection of the Department of Geology in the United States National Museum. It can be safely predicted that this onyx in time will rival those of Mexico.

### TURNOUT IN A QUARRY RAILROAD

A feature of the unique equipment installed by the Lidgerwood Mfg. Company, of New York, in a quarry in Southwestern Nevada.

dem, the rear drum bolted to the drum gear, and the front drum so arranged as to serve for an idler. Each drum is 53 inches in diameter. The slip rings are composed of crucible cast steel and grooved for 1-inch rope. A heavy hand operated post brake is fitted on the rear drum, this rig to be used for emergency purposes only, or for locking the hoist when the cars have reached the terminals. The brake on the motor armature shaft is fitted with a solenoid and is set by dead weight. The solenoid is controlled either from the control panel or by the limit switches suitably wired through a main line oil switch. The drum shafts throughout are of hammered steel, the gearing of cast steel with cut teeth, the bearings throughout of the low pillow block type, the bed-plate of cast iron.

The electrical equipment comprises General Electric Company's slip ring induction motor, 100 horsepower continuous rating, and the control consists of a complete equipment of contractors with seven points automatic and four points hand control. The rheostat

## Stripping a Marble Quarry

**M**OST marble quarried is of a high grade, and the bulk of rock removed is small in comparison with the quantity handled in many quarries where rock is obtained for cement or road construction, says Oliver Bowles, in "The Technology of Marble Quarrying," published by the United States Bureau of Mines. As a consequence the area stripped is usually not great enough to justify the use of steam shovels.

When the surface of a deposit is fairly level, teams and scrapers may be used to advantage. Usually, however, the overburden of soil is so placed that it must be removed by means of large pans which are loaded by hand and handled with a derrick hoist. In order to remove the soil to a sufficient distance from the excavation, cars and tracks may be necessary. A serviceable car for this purpose is shown in Plate III, A. The loaded pan is placed on the car by means of the quarry derrick. Horizontal iron bars on the undersurface of the pan are placed in the iron sockets of the car. These trunnions are so placed that a little more than half the weight of the load is toward the rear end of the car. When the car reaches its destination, the back of the pan is raised, thus overbalancing the load, and dumping it from the front of the car. Where soil must be removed to a great distance, the loaded pan may be dumped into railroad or cable cars.

A common mistake in the process of stripping is to remove the soil and waste to an insufficient distance from the excavation. The desire to attain quick results at small expense, and lack of foresight regarding the probable extent of future operations are the chief causes of insufficient removal. As a consequence, quarrymen may find after a few years' operation that they must handle material a second time, thus adding greatly to the expense of quarrying. The extensive marble workings of Italy, in the neighborhood of Carrara, Massa and Seravezza, are greatly hampered by accumulations of rubbish which have buried vast quantities of good marble. The market price is too low to allow the removal of this debris.

Lack of foresight is also shown at some quarries where quarrymen dump their waste material into abandoned excavations. This procedure may be justified if there is no probability that the pit may ever be reopened. The practice has been observed, however, in places where it seemed that greater success would have been attained by going deeper in the old pits than by making new ones.

Another mistake in the disposition of waste material is due to the inability of the operator to foresee the direction in which future operations will extend his quarry. As regards steeply tilted beds, it is obvious that if excessive depth is to be avoided development

can take place only in the direction of strike. Nevertheless, at certain quarries of this type observed, stripping has been deposited directly in line with the strike of the beds, and thus an extension of the quarry excavation must soon overtake a great heap of accumulated debris.

For the removal of both soil and waste rock to a sufficient distance to avoid interference with future operations an overhead cableway hoist may be desirable. At one quarry at which such a cableway is used the hoist engine is mounted on a truck that travels on a curved track. It can thus be shifted to strip in different places. Where difficulties are in the way of removal of stripping by derrick or car, the advisability of adopting a cableway system may be considered.

Hydraulic stripping is employed with success in several marble quarries. There are certain conditions, however, that must be met in order that hydraulic stripping may be successful or even possible. Two important conditions are an adequate water supply and easy drainage. If the water supply is obtained from drilled wells or small streams that may go dry, the process will probably fail.

The soil removed by hydraulic stripping may be disposed of in several ways. It may be carried away in a stream valley and deposited naturally at various points along the course of the stream. In some places, however, the deposition of the soil along the stream valley would be detrimental to agriculture or to other interests. In that event, a dam may be built forming a settling basin. In certain operations, surface soil is conveyed to abandoned quarry pits. With such disposal surface drainage is also necessary in order to get rid of accumulated water. Also one must be sure that there will be no future desirability of reopening the pit, as reopening would not be feasible after the pit was once filled with soil.

In certain quarries in Georgia, the good marble is underlaid by a hornblende rock. When in the process of quarrying the hornblende rock is reached, the pit is abandoned, and can then be used as a settling basin in the process of hydraulic stripping. Those who have had experience in hydraulic stripping estimate that the cost of soil removal by that method may be as low as 2 cents per cubic yard.

### Virginia the Greatest Soapstone State

In the production of soapstone the United States ranks first among all countries, and Virginia produces about 20 times as much as the four other producing states—Maryland, North Carolina, Rhode Island, and Vermont. The waste from breakage in quarrying, sawing into slabs, manufacturing, and final transportation is so great as to render success in the industry

a matter of skillful manipulation. The value of the stone is in large measure proportionate to the work done upon it. In the rough it is valued at \$2 or less a ton, but when sawed into slabs its value is increased to about \$15, and when made into laundry tubs it may attain a value of about \$30 a ton. The production of soapstone and talc in the United States is steadily increasing, according to the United States Geological Survey, Department of the Interior. In 1900 it was 27,943 short tons, in 1910 it was 150,716 tons, and in 1915 it was 186,891 short tons.

### Confederate Monument at Shiloh

The cornerstone of the \$50,000 Confederate monument that the United Daughters of the Confederacy are to erect on the battlefield of Shiloh has just been laid. When completed the monument will represent years of patient work on the part of the Daughters of the Confederacy in raising the money. Though the battle of Shiloh, fought April 6-7, 1862, was one of the most important of the war, the national military park there contains but three monuments to commemorate the part played by Southern troops in the battle. The monument now under construction will be the most imposing in the park. It is being constructed of Mt. Airy (N. C.) granite. In the centre rises a bronze group, the subject of which is "Victory Defeated by Death." Under the figures set in the granite is a bas relief of General Albert Sidney Johnston, the Confederate commander killed there. At either end of the granite monument is a group of soldiers. Frederick C. Hibbard, of Chicago, designed the memorial.

### Personal

W. C. Knighton, formerly architect for the Oregon State Board of Control, will resume private practice in architecture, with offices in the Tilford Building, at Portland, Ore.

Beckert, Hubel & Akitt have opened architectural offices in the Chamber of Commerce, Detroit, Mich.

### A Crushing Plant for Syracuse

The city officials of Syracuse have paid a visit of inspection to the Auburn municipal stone crushing plant. They were not entirely satisfied that a similar plant would be a practical investment for Syracuse. Commissioner of Public Works Williams, of Syracuse, said that it would probably cost that city \$10,000 to duplicate the Auburn plant, which was installed seven and a half years ago at a cost of \$8,500. He did not think that the stone could be had at less cost than now, but that the sole advantage would be that the city could get stone when wanted and in the quantities wanted, whereas now there was sometimes difficulty in

obtaining a supply. The questions of securing a quarry and the cost of transportation from the quarry to the street are the ones which will be given further investigation. It is understood that a quarry of good quality stone can be leased in or near Syracuse at a cost of about two cents a ton for stone taken out.

### A Red Granite Quarry in Manitoba

The Canadian journals, in describing the work of the commission which is to furnish a water supply for Winnipeg and a number of neighboring cities, declare that a deposit of red granite has been discovered 71 miles from Winnipeg. The stone is fine-grained

REPAIRING TERRA COTTA ON THE WOOLWORTH BUILDING  
Despite the short time the building has been completed, it has been necessary to go over the joints and replace many of the terra cotta blocks.

and the deposit is said to be of almost unlimited extent. The discoverers are confident that it is one of the finest granites on the continent. A company has been formed to develop and operate a quarry.

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A JOURNAL which advocates the use of concrete tile declares that when these are properly made they are durable, but it enumerates as frequent causes of failure the use of too lean or too dry a mixture, improper hardening, and placed in the ground too soon after making. This is the trouble that is generally found with most concrete work, there are four chances or more of failure to one of success. When the builder, the engineer, or the farmer uses an honest, natural product he is not taking a four to one shot. He is using a material that has been proven by the experiences of centuries and he can count on satisfactory results.

WHY is it that the average newspaper writer seems to think that "granite" and "marble" are synonymous terms? Perhaps it is not remarkable if a layman cannot identify a particular stone, although the differences between marble and granite are generally sufficiently marked for any one to recognize. The astonishing thing is that the two words are often used interchangeably for the same stone. An enterprising reporter on a Washington newspaper, writing of the development of a granite quarry, say that the owner of the property had no idea that there was marble on the land with an investigation showed that it was all underlain with high-grade granite. However, we must admit that a certain marble was for years called a granite in the trade, and that another fossiliferous marble was put on the market as a granite.

A VERY peculiar condition has arisen in Mercer County, N. J. The county operates quarries with convict labor, and the city of Trenton claims that it cannot get its share of crushed stone. Affairs have reached such a stage that the city officials threaten mandamus proceedings against the board of freeholders to com-

pel the county to deliver the stone to which the city claims it is entitled. Feeling runs very high, and Trenton claims that this controversy comes up every year. The county officials say that because Trenton has to pay a large part of the cost of keeping the county roads in repair, it thinks it is entitled to its full share of stone whether the small towns get their supply or not. The county officials offset this claim by the statement that a large percentage of the cases tried in the county courts, necessitating a big outlay of money annually, emanate from the city, and that a great number of the prisoners kept and supported at the common jail at the expense of the county are committed from the city.

THE State Industrial Commission of New York has instructed several of its officials, together with advisory committees made up of employers and employees, to make personal inspection of typical quarries in the State. So far, little has been done in this country with regard to the supervision and regulation of quarries. In Great Britain the department of the Home Office is charged with the regulation of all mines and quarries and general rulings for their operation are formulated. None but "permitted explosives," the formulæ for which have been filed with the Home Office, can be used and all accidents are investigated by government inspectors. Since the enactment of our stringent compensation laws it is manifested that the State will have to undertake a closer supervision of industrial work that is ranked as more or less hazardous.

MINNEAPOLIS has just completed the greatest year of street paving in its history. By the end of the year it is estimated that 25 miles of paving will have been completed, in comparison with last year's 15 miles, the record year to that date. Although only a comparatively limited amount of granite block paving was laid, the engineering department of the city declares that the small section of highway finished in the granite blocks demonstrates conclusively that this form of paving is the best for traffic streets when properly laid. "The old method of laying the blocks in sand and filling the joints with the same material resulted in their rapid wearing and a rough pavement," says the Assistant City Engineer. "Granite blocks laid on a concrete foundation with three-eighth inch joints filled with asphaltic mastic is the future paving for traffic streets." This confirms the experience of every city that has made a trial of improved granite paving.

IN an editorial last month we spoke of the use of convict labor in producing crushed limestone in Oregon, taking occasion to say that for some unknown reason the lawmakers always seem to think that the stone industry is a proper field for exploiting prison labor. This article called out a letter from one of the best posted stone men of the Middle West, who says: "I think it is just as unfair for capital involved

in a stone crushing and grinding plant to have State competition as it is in any other industry. I believe that the distribution of agricultural ground limestone would be very much stimulated if penitentiary plants are eliminated. As it is, penitentiary plants cannot produce enough to supply the demand, yet keep private capital from embarking in the business. The Chester, Ill., penitentiary, for example, sells ground limestone for agricultural purposes, I am advised, at about 60c per ton, f. o. b. Chester,—that is, less than the cost of production in a regular industrial establishment. There is, however, an equally weighty objection to the employment of convict labor in plants of this kind, and that is tuberculosis. Convicts are notoriously susceptible to the disease named. Employment in or about plants crushing and grinding limestone is hazardous through the inhalation of dust for healthy men not subject to close confinement, of itself productive of tubercular conditions. I, therefore, contend it is criminal to use convicts in or about plants of the character under consideration above." This, certainly, is another most convincing reason why the State should leave the stone industry to private enterprise.

THE New York Board of General Appraisers has just given an interesting decision to the effect that crushed stone is not raw material but a manufactured product. The distinction is an important one, for the manufactured product is protected by a duty of 20% while raw stone comes in free. The matter is a rather involved one, as the only difference between raw stone and that which has been crushed is in the size of the pieces. It is generally held that the process of manufacture changes the nature of the material in other ways than mere size. We fully understand the difficulties that confront the appraisers in classifying certain products and we are not prepared offhand to dispute this ruling. At the same time it may be said that the custom officials make many ridiculous decisions with the idea of exacting heavy duties. The distinction between manufactured articles and works of art is a case in point. Our sapient custom inspectors are not inclined to allow anything to pass as a work of art when they can tack on a higher rate for a manufactured article. They seem utterly unable to distinguish between an artist and an artisan. One of the most flagrant of their rulings has been the classification as dressed stone of blocks that have been merely scabbled. There can be no justice in calling a stone dressed unless it has received a finish that fits it for ultimate use. Scabbling is merely the cutting off of useless projections from a block in order to reduce the shipping weight. As far as finishing is concerned, a scabbled block is no more fitted for use than a rough boulder, and it must be sawed, cut or dressed before it is used. With regard to crushed stone, with a little care in selection a carload of the natural product could be obtained that could not be distinguished from that

which has passed through a crusher, and yet it would be utterly impossible to hold that this was manufactured. In the making of custom rulings the keenest expert knowledge is essential.

LAST month we spoke in these columns of a church building to be erected with artificial stone trimming. We based our comments on what appeared to be an official and authoritative account of the new structure. This said that "the construction of the building will be of hollow tile walls, faced with tapestry brick, concrete stone trim, including cornices, slate roof and opal windows." We have received a letter from the pastor of this church in which it is claimed that an injustice has been done to his congregation. He says that the building will have Indiana limestone trim for the front and tower elevations and reinforced concrete for the water-table, window sills, etc., for the side and rear elevations, and tapestry brick for the Gothic window tops for the windows, as the building is not located on a corner lot. We are glad to make this correction and to know that the major part of the trim will be of honest natural stone. Nothing is said by the minister, however, about the cornice and we have no means of knowing whether this is to be of the imitation material. We have no desire to work any injustice and we shall be glad to believe that this congregation will insist upon solid and honest construction. We believe that it is a mistake to carry concrete up even as far as the water-table, because any portion of the walls that stand above the ground level are sure to show cracks and disintegration within a short time. We also think that it is poor judgment to use any form of artificial material for window-sills or lintels even on side or rear walls that are not readily visible. These are portions of a structure that are readily attacked by the weather and they should be of the best material that is available. A large and expensive commercial building was recently erected in this vicinity in which the sills and lintels were of artificial stone. After a comparatively short exposure these went to pieces and the owner of the building was put to considerable expense in replacing them with natural stone. The point of our original criticism was not the matter of economy but the fact that the substitutes for stone that are used to save a few dollars are palpable shams and have no place in a House of God.

### The Abbey Memorial at Enfield

A few days ago there was unveiled at Enfield, Conn., a statue of Captain Thomas Abbey. The memorial is a gift to the town from the family of Alden Freeman, of East Orange, N. J. Mr. Freeman is a great-great-grandson of Captain Abbey, who was a hero of the American Revolution.

The memorial, designed by McKim, Mead & White, is the work of Sherry Edmundson Fry, sculptor of the

figures on the Music Hall of the Panama-Pacific Exposition. The statue, which stands on the green opposite the Enfield Church, is surrounded by marble seals in Greek style, bearing inscriptions commemorating the achievements of Captain Abbey's descendants in literature, art, science and warfare.

### Monuments to National Heroes

Under the auspices of the National Society of the Daughters of the American Revolution, an important movement has been started for the purpose of erecting monuments and other materials throughout the country to America's patriot dead, with special reference to George Washington, Thomas Jefferson and other historic figures. Mrs. William Cumming Story, president-general of the society, says that America is more deficient in monuments and other forms of enduring mementoes of its national heroes than any other country. It has been decided by the National Board of Management of the Society, at a recent meeting, that the first subject for a competitive exhibition of designs for statues and memorials shall be the "Father of His Country," to be followed later on by exhibitions of designs of other great patriots.

### War and Quarry Labor in England

A striking example of the influence of the war on important national industries is afforded by proceedings before the Carnarvonshire Appeal Tribunal, says an English exchange. The Penmaenmawr and Welsh Granite Company have suffered the loss of 1,085 men from their quarry-workers, and now employ 594 men only, of whom 165 are of military age. The Tribunal has decided that of the 123 men who are eligible, 30 shall go in one month, 30 in two months and 30 in six months, although half of the present output of the company is in respect of contracts for Government work. And yet there are people who urge the granting of facilities for the importation of foreign granite at the present time.

### Quarry Notes

C. A. Campbell will erect a dam on Pigeon River near Afton, Mich., to furnish power for his quarry at that place.

L. O. Paquin, of Manistique, Mich., will open a stone quarry four miles east of Trout Lake, Mich., on the Soo Line.

Five hundred employees in the quarries at Marble Cliff, Ohio, went on a brief strike during the past month because a new superintendent was put in charge. The men returned to work when they were assured that there would be no change in the methods of management. There was no trouble over wages or hours.

Morgan & Co., of Hurley and Ironwood, Mich., are making improvements to their crushed stone plant at the latter place.

### Big Lime Plant Burned

The big plant of the Standard Lime Company, two miles from Lee, Mass., was badly damaged by fire during the past

month. Owing to a lack of sufficient water, it was difficult to check the flames, and nothing but the solid construction saved the plant. On examination it was found that the kilns and heavier machinery were not seriously injured, and that the plant can probably be put in running order for \$25,000. It will be rebuilt at once. The property is owned by Albany and Hudson capitalists.

The kilns of the Standard Lime Company were started two years ago, after more than a year in process of construction. They were gas-burning kilns of the very latest pattern and with a superior stone produced a fine quality of hydrated lime, and from the start have been unable to fill the demands upon the plant.

### Trust Charge Against Monument Men

Ten monument dealers in Portland, members of the Oregon Monument Manufacturers' Association, have been arrested on warrants sworn out by U. A. Tibbetts, Portland salesman for the Blair Marble Company, of Ashland. The men arrested were: John Brookner, L. L. Jones, H. J. Blaessing, Leon Jones, Philip Neu, Earl Perry, J. H. Imhogg, N. A. Schanen, A. D. Schanen and Ernest Shuman. Mr. Tibbetts charges that the organization of monument dealers, as represented by these men, are trying to suppress competition and put him out of business by price-cutting, etc. The Blair Marble Company, which has the contract for the stonework on the new Portland Auditorium, repudiate the action of their salesman, and say that in this case he does not represent them, but only himself individually.

### New Companies

A. C. Pfaltz Co., Inc., of Stapleton, L. I., to deal in marble, granite, limestone, terrazzo, etc. Capital, \$5,000. Incorporators: A. Avon, H. J. Hills, A. C. Pfaltz, Stapleton.

The Laurel Slate Co., Inc., of New York, to deal in marble, tile, slate, blackboards, etc. Capital, \$10,000. Incorporators: C. E. McChesney, L. H. Orr and E. J. Johnson, Westfield, N. J.

The Electric Hammer Co., of the Borough of Queens, N. Y., to manufacture tools for dressing stone. Capital, \$10,000. Directors: Willard F. Meyers, of Jamaica, Morris Simons, of Bath Beach, and Abraham Simons, of the Bronx.

Mariner & Tupy, Inc., Sioux City, Iowa, to do a general stone cutting and marble business. Capital, \$15,000. Incorporators: F. C. Mariner, J. L. Tupy and R. H. Burton-Smith.

The Silver Gray Marble Co., of Knoxville, Ky., to quarry and manufacture marble. Capital, \$75,000. Incorporators: Charles H. Brown, A. Y. Burrows, Sylvus E. Hodges, Neil B. Spahr, Robert D. Taylor.

H. J. Hoerner & Sons, of Newark, N. J., to do a general cut stone and marble business. Capital, \$120,000.

The Sussex Limestone Products Corp., of Franklin, Sussex County, N. J., to quarry and manufacture limestone. Capital, \$200,000. Incorporators: Charles G. Wingate, Robert Kuzmier, Thomas G. Durkon, New York.

The Harris-Collins Corp., incorporated under the laws of Delaware to quarry and prepare for market all kinds of building materials. Capital, \$1,000,000. Incorporators: Wilson R. Hunter, Arthur S. Ford, Benjamin Thayer, all of New York.

The Kalamazoo Gravel & Sand Company, of South Bend, Ind., to quarry and deal in sand granite etc. Directors: Edward Jeffrey J. R. Preston and D. C. Rogers. Capital, \$75,000.

The Durax Granite Co., to quarry and manufacture granite, incorporated under the laws of Delaware. Capital, \$10,000. Incorporators: M. L. Rogers, L. A. Irwin, Harry W. Davis, Wilmington, Del.

# The Laying-out of Stonework—Part XVI

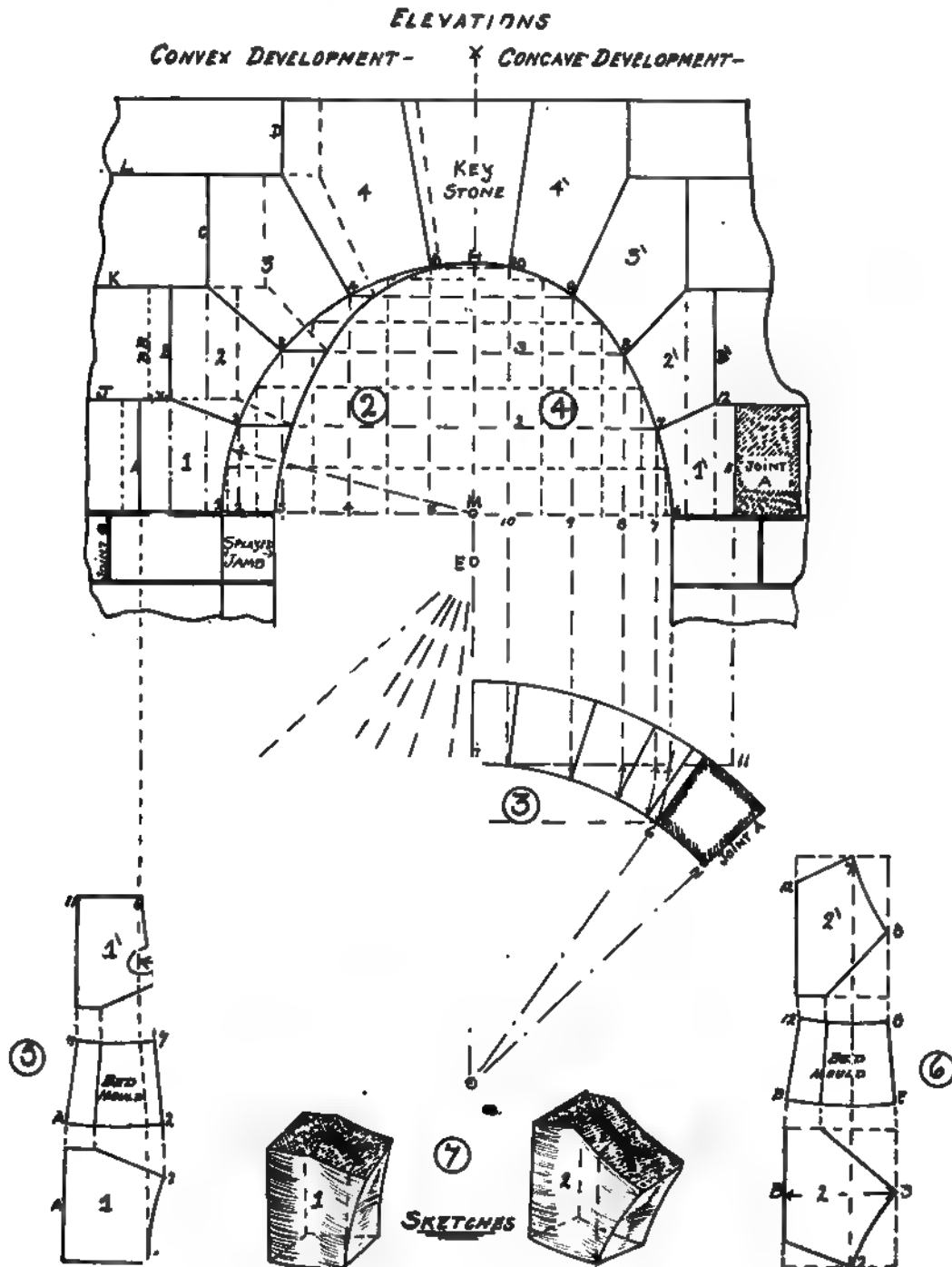
By D. T. PATTERSON, Edinbrough

I HAVE now the pleasure to submit to the readers of *STONE* the first example of arched openings in circular walls. In this example, the reveals or ingoings of the openings radiate from Center E, from which the cylindrical wall is struck, and as the convex arch is semi-circular on development and the ingoing at the crown is horizontal, the arris of the arch on concave face will form an elliptic curve on development, consequently throwing considerable twist upon the intrados and a slight twist on the radial bed joints of voussoirs. Figs. 1 and 2 represent half plan and elevation of convex face. Figs. 3 and 4 half plan and elevation of concave face.

Commence with center E and lay out plan, Fig. 1. Next develop or straighten out convex arc A F as line F G, pro-

ject same to springing line and with radius equal to stretch out of arc F 1, set up convex developed elevation Fig. 2, all according to requirements.

From quadrant line 1 H drop ordinates 2, 3, 4, 5 along with intermediate divisional points, either to springing line or directly on to line F G, Fig. 1. Next transfer these points around convex face of plan and radiate them through plan as 10, 9, 8, etc. Stretch out concave arc Fig. 1, 16 to 11 including all divisional points; this line will equal straight line I 11, Fig. 3. Protect ordinates 7, 8, 9, 10 and intermediate points to Fig. 4, 7 to, intersect horizontal line 2, 8 to 3, etc., and through points of junction drawn the quarter ellipse 6, H giving the curvature of soffit arris on concave elevation.





Next extend horizontal lines of walling courses J K L from Fig. 2 to Fig. 4, and from center M produce radial joint lines 7, 8, 9, etc., to cut the horizontal lines of before mentioned wall courses, as 7 to 12, etc. This will also determine the vertical joint lines of voussoirs on concave face, which if correctly located should radiate through to corresponding line on convex face.

To exemplify this I take one example, from Fig. 2 take voussoir No. 2, B is the radial vertical joint, mark the horizontal distance along springing line from Center M to B. Bend this length around plan which equals F to B, radiate B through plan to point 12, take the stretch out of concave arc, I 12, and transfer to springing line Fig. 4, when it will be found to coincide with vertical joint line of voussoir 2' as line B'. *Moulds*—Each voussoir requires one bed mould and tow face moulds; these are depicted herewith and linked up together at Figs. 5 and 6. Fig. 6—Face mould 2 is obtained from Fig. Face mould 2' from Fig. 4. The length of block required is determined by the longest horizontal line across face mould as line B to 3 on face mould No. 2 Fig. 6, observe the corresponding notations around plan Fig. 1, as B to 3, C to 4, etc., etc. Fig. 7 shows sketches of the finished stones 1 and 2.

*Notes*:—Arch headed openings over circular walls are, generally speaking, structurally weak, and this should be borne in mind by the designer. Fig. 8 I have purposely drawn to illustrate my point clearly, representing the arch here cut down through the center line H M and showing how this type of masonry construction oversails in corbel like fashion.

Note the projection at line N, the corresponding line of which I show on plan, Fig. 1, as N'.

For these reasons the voussoirs should be well bonded into the adjacent wall courses and stones, 2, 3, etc., should have kneed beds on under side, as line B B, Stone No. 2, at wall courses J. K. Each radial bed should also have deeply cut V joggles as indicated on sketches of finished stones and well flushed up with cement grout at the time of setting.

Further problems on the circling of stone work will be dealt with in subsequent numbers.

### Business Brevities

The first of the cut stone for the completion of St. Matthews Cathedral at Laramie, Wyo., was set during the past month. The towers are the gift of Edward Iverson, a retired banker and one of the pioneers of the town.

The County Commissioners of Wells County, Ind., have just let contracts for the construction of several miles of stone roads.

The New York State Commissioner of Highways will shortly award contracts for the construction of nearly 200 miles of stone roads.

The Interstate Commerce Commission has approved the increased rates on crushed stone products between certain points in New England, filed by the railroads in that section. The change will take effect on November 15th.

Oklahoma City is raising funds for the erection of a soldiers' monument in Franklin Cemetery. Those who are at work on the project advocate the use of Oklahoma granite for the memorial.

More than 3,000 men were thrown out of work when the quarries and mills in the Bloomington, Ind., district were shut down, after a general walkout because of a refusal to recognize the steam hoisting union.

New Bedford, Mass., is collecting funds for the erection of a Lafayette monument.

The sum of \$120,000, the gift of Harriet Lane Johnston, niece of President Buchanan, is now available for the erection

of a statue of President Buchanan in Washington. The design has been approved by the National Commission of Fine Arts and work will begin as soon as Congress grants a site.

Because of a shortage of men in the stone quarries near Haverhill, Mass., street work in that city has been held up.

The City of Brockton, Mass., will vote on the question of appropriating money for the erection of a soldiers' monument.

The Michigan Quartz Silica Company, whose mill near Marquette, Mich., was recently destroyed by fire, expects to rebuild. The company has been operating to full capacity and yet was behind in its orders.

The Texas Retail Monument Dealers' Association held its semi-annual convention during the past month.

The Universal Crushed Stone Company, of Racine, Wis., has increased its capital stock \$10,000.

### Notes from the Stone Fields

#### MARBLE AND GRANITE

The Stotzer Granite Company, of Portage, Wis., has formed an Illinois corporation under the same name in order to extend their business to that State. The officers are: R. G. Stotzer, president; C. J. Mueller, vice-president; O. F. Stotzer, secretary; L. O. Mueller, treasurer. They will conduct business at 31 N. State Street, Columbus Memorial Building, Chicago. The Chicago branch will be in charge of A. W. Faerber and F. P. Werner.

A complete equipment of pneumatic tools, operated by electric power has been installed in the new marble plant of E. C. Lake, on Willamette Street, Eugene, Ore.

An attractive soldiers' memorial in Barre granite has just been erected in West Danville, Vt., by A. J. Goss, a Danville granite dealer. It was cut by Cook, Watkins & Co., of Barre.

Manager William C. Clifford, of the Woodbury Granite Company, has just closed a contract to furnish \$100,000 worth of Woodbury gray granite for the new building to be erected by the Mercantile Trust Company in St. Louis. The general contract has been awarded to the Wimmer Construction Company, while the Woodbury Granite Company, as subcontractors, will cut and set the stone.

It had been planned in Paterson, N. J., to erect a new building for Public School No. 6, on Broadway, in that city, with a marble front. The Board of Education at a recent meeting decided that the new building, complete, should cost not to exceed \$275,000, which will necessitate the use of some other material.

The Rev. Herbert S. Johnson, of the Warren Avenue Baptist Church, Boston, suggests that a marble statue of the American aviator, Norman Prince, recently killed in action in France, should be erected in the heart of Commonwealth Avenue, in the event of the proposed Prince Memorial at Harvard being abandoned because of antagonistic sentiment.

A marble shelter house and a steel observation tower will be erected on the summit of Pike's Peak by the Pike's Peak Automobile Association.

Last June the common council of Germantown, Pa., passed an ordinance for the paving of Germantown Avenue with wooden blocks, but the Germantown and Chestnut Hill Improvement Association urged the use of granite blocks instead. As no public demand was heard for the wooden blocks, the council has given assurance that the avenue will be paved as the people of Germantown desire it.

The United Congregational Church of Bridgeport, Conn., has adopted plans for the new church to be erected on Bank and Broad streets in that city. It will be of brick and marble. Because of the large amount of stone in the structure it is expected that it will take a year to complete the building. The plans are by Cass Gilbert, of New York.

The Marathon Granite Company is engaged in building a large addition to its plant in Wausau, Wis., made necessary by the growth of its business.

The citizens of Ohio have dedicated a granite memorial to former Governor James M. Cox, for his work in the rehabilitation of the old national trail. The memorial is located on the old trail at a point 14 miles west of Zanesville and 42 miles east of Columbus. It consists of a huge granite boulder, resting upon a granite base. On the face of the boulder, which was carried to the Scioto valley thousands of years ago by glacial action, have been carved representations of an old prairie schooner and a modern motor car. High above the memorial towers a mass of Ohio native sandstone, scoured smooth by the storms of countless centuries.

There has been erected in Elmwood Cemetery at Bradford, Mass., an elaborate and beautiful memorial to George Haseltine, the famous patent lawyer of New York, who was a native of Bradford. The memorial consists of a central shaft surmounted by a dome-like cap, elaborately carved, and surrounded by fluted columns. It consists of twenty-seven pieces, the largest weighing twenty, eighteen and fourteen tons respectively. It was executed in Barre granite by the Presbrey, Coykendall Company, of New York.

The city of Atlanta, Ga., has let contracts for a large amount of granite paving.

The Waushara Granite Company has installed a new compressor at its plant in Redgranite, Wis. The company has just put an additional gang of 25 paving cutters at work, and expects to keep them busy all winter.

The Vermont Supreme Court has affirmed the judgment of the lower courts in favor of the plaintiff in the case of the Vermont Marble Company against George P. Eastman and Percival W. Clement, of Rutland, for trespass.

The Meadowbrook Marble Company, which recently opened a quarry south of the railroad station in Brandon, Vt., has taken out some large blocks of marble. The outlook is so encouraging that there is talk that the company will soon build a large mill, to be equipped with modern marble-working machinery, and operated by electric power, which is being furnished by the Hortonia Power Company, to operate the quarry machinery. A railroad track is now being laid from the main line to the quarry.

In the suit of the Colorado Yule Marble Company against Eugene Schuler, to recover about \$5,000 alleged to be due as a balance for material furnished for the post office at Pasadena, Cal., the marble company introduced a letter in evidence, tending to show that inferior material had knowingly been used in the construction of the building.

#### LIMESTONE AND SANDSTONE

Owing to the adverse conditions of the war on the building trade in England the contractors of the Bath and Portland stone firms have to report a loss of \$7,500 for the half year to June last in comparison with a profit of \$31,600 for the corresponding six months of 1914. The company paid a dividend of 5 per cent. in 1914 and 4 per cent. in 1915 and now for the first time the shareholders have to go without a dividend.

It is reported that options have been taken on a number of quarries between Phelps and Clifton Springs, N. Y., that contain large deposits of shale rock. It is said that a cement company plans the erection of a factory at Phelps that will cost in the neighborhood of three-quarters of a million dollars.

The superintendent of the water works system of Columbus, Ohio, will ask the city for a bond issue of \$30,000 to install an equipment for the manufacture of lime used at the filtration plant. The city now spends more than \$12,000 per year in the purchase of lime.

The property of the National Limestone Company, at Martinsburg, W. Va., was sold during the past month in obedience

to a decree of the United States Court. A reorganization committee composed of James S. McNulty, of Scranton; U. M. Fell, of Towanda; Clarence L. Peaslee and W. W. Jackson, of Williamsport, Pa., bought in the property for \$200,000. It consists of a thoroughly modern plant with over 21,000 acres of valuable limestone lands. The company became involved when a Williamsport trust company, representing bondholders, brought foreclosure proceedings. After the sale has been ratified by the Federal courts the plant will be reopened for operation on a large scale.

A shipment of Indiana limestone has been received at Poughkeepsie, N. Y., for the erection of the new St. Mary's School at that place.

The Conley Stone Quarry, south of Oneida, N. Y., is operating to its full capacity these days, but is unable to fill all of its orders. The company has experienced some difficulty from the scarcity of labor.

More than 60 pieces of Minnesota stone, weighing about 25 tons, that formed a balustrade in the Mines Building, at the St. Louis Exposition, have been shipped to the National Museum at Washington, where they will form a part of the permanent exhibit of building stones.

There was an immense landslide at the quarries of the Basic Refractories Corporation at Natural Bridge, near Lowville, N. J., during the past month. An immense cliff became lowered in some manner and dropped into the pit, a distance of 85 feet, burying considerable machinery and tools. The accident occurred at night and no one was injured.

It is reported that the Connecticut Chemical Company will erect a plant at Canaan, Conn., costing \$250,000 for the manufacture of acetate of lime.

It is stated that the Basic Products Company, of Kenova, W. Va., will erect an addition to its plant, costing \$250,000, that will double its output of limestone products for steel manufacture.

Randolph Valz and Najah Taylor, of Staunton, Va., have bought the plant of the Catt Limestone Company, just east of Staunton. They have formed a new corporation known as the Staunton Lime Products Company, to operate the plant and furnish ground limestone for agricultural purposes.

A committee composed of one representative each of the State Grange of Oregon, the State Taxpayers' League, the Farmers' Union and Oregon Agricultural College and one delegate at large, has been named to frame a bill for the purchase of lime deposits of Oregon and the operation of the same to produce a ground limestone for agricultural purposes. The committee will urge the passage of such a bill by the Oregon Legislature.

A branch of the Baltimore & Ohio Railroad has just been completed from Hagerstown, Md., to the plant of the Security Cement & Lime Company, at Security, Md. This line will give the company much needed shipping facilities.

#### SLATE

For several years the quantity of roofing slates imported into Great Britain has shown a steady decline, according to one of our English exchanges. In 1913 there was brought into that country 17,601 tons of foreign slates; in 1914, the figures dropped to 9,949 tons, and last year there were only 4,087 tons, or less than a quarter of the quantity imported two years previously. As an offset to this, however, the war conditions have prevented the usual exportation of Welsh slates, so that the quarries are in no better condition. Our contemporary believes that the Welsh quarries will not be able to better themselves at the close of the war unless they rise to the occasion and organize and advertise in as strenuous a manner as the makers of artificial roofing materials have been doing for a long time.

The Baltimore Peach Bottom Slate Corporation, organized

under Maryland laws, has been reorganized with \$300,000 capital, and with Carl R. Gray, Jr., son of the president of the Western Maryland Railway, as president and general manager. The stock is divided into \$100,000 of first preferred, \$100,000 of second preferred and \$100,000 of common. The second preferred stock was given in exchange for the outstanding bonds of the old company and the common stock is given as a bonus for the sale of the first preferred. The corporation owns 120 acres of slate land, with several developed quarries, at Cardiff, Md.

### Construction Notes

The town of Phoenix, Oswego County, N. Y., was recently destroyed by fire and a committee of personal and political friends of Speaker Thaddeus C. Sweet, of the New York Assembly, has sent a check for \$10,000 to the town, and request that it be used for the erection of a suitable municipal building which shall be a memorial to his work in his home town.

The 950 Park Avenue Company, John H. Carpenter, president, will erect a 14-story apartment house, to cost about \$400,000, at Park Avenue and 82nd Street, New York. It will be of limestone and brick.

The Santa Fe Railroad will erect a 12-story office building at the corner of Second and Market streets, San Francisco. The first two stories will be of selected Colorado Yule marble and the interior finish will be in marble and travertine stone. Plans are by Wood & Simpson.

"The Thrift," a Brooklyn loaning institution, will erect a banking building on the Pratt Institute block, Brooklyn. The building will be of granite, limestone and brick. The base of the building will be of Milford Pink granite, while the corners and pilasters will be of Indiana limestone. The architects are Shampan & Shampan, 772 Broadway, Brooklyn. The style will be of the Italian Renaissance, the details having been modeled to a great extent after the Forum of Trajan in Rome.

Architect J. W. Woltz, of Waynesboro, Pa., has prepared plans for a stone and brick Methodist church at Kabletown, West Virginia.

The cornerstone has been laid for a new dining hall for Princeton University, which will cost about half a million dollars. This is one of a group of new buildings, which are to be constructed of gray New Jersey stone, quarried near Princeton.

The Mary E. Pinchot estate is erecting a 12-story automobile service station at 109 West 64th Street, New York. The architect is Walter Haefeli, 248 West 55th Street, New York. The front will be of granite, limestone and brick.

The Pottstown Machine Company, is building a new office and laboratory building at Pottstown, Pa. The structure is of stone and brick.

A new building will be erected for the New York Congregational Home for the Aged at 123 Linden Avenue, Brooklyn. The plans are by Wm. A. Parfitt, 26 Court Street, Brooklyn, and the building will be Colonial style, of limestone and brick.

A Siegel will erect a 6-story apartment house on Ross Street, near Lee Avenue, Brooklyn, after plans by Shampan & Shampan. The trimmings will be of granite and limestone.

A new armory is being built at Taunton, Mass. The building is of brick, with Indiana limestone trimmings.

Plans have been made by Providence architects for a building to be erected in Providence, R. I., exclusively for the use of doctors. It will be of limestone and brick, with marble interior finish.

The Security National Bank, of Sioux Falls, N. D., is erecting what is declared will be, when completed, one of the handsomest and most modern bank buildings in the West. The base courses will be of gray Georgia granite and above this and extending to the second floor windows is Bedford limestone, artistically carved. The main entrance will be flanked by two massive stone columns, 2 feet in diameter and 21 feet high, fluted. The interior will be finished in gray Tennessee marble and Taverneville marble.

William L. Mowll, 185 Devonshire Street, Boston, is preparing plans for a new building for the Cambridge National Bank.

The General Hospital of Lowell, Mass., will erect a two-story hospital building on Varnum Avenue, Lowell, costing

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### Government Work

Bids will be received at the office of the Supervising Architect, Treasury Department, Washington, until November 14th, for the construction of the postoffice at Media, Pa.; until November 22, for the construction of a post office at Franklin, Va.; until November 17th, for remodeling the United States Custom House at New Orleans; until November 29th, for the construction of mezzanine floors and alterations at the post office and court house of Philadelphia, and until December 22, for the extension and remodeling of the post office and court house at East St. Louis, Ill.

Bids will be received at the office of the Supervising Architect, Treasury Department, Washington, until November 28th, for the construction of a new post office at Beaver Falls, Pa., and until December 7th, for the construction of a post office and custom house at Chadron, Neb.

The contract for the construction of the post office at Dickinson, S. D., has been awarded to Charles Weitz Sons, Des Moines, Iowa, at \$71,287.

about \$125,000. The plans are by Kendall, Taylor & Co., 93 Federal Street, Boston.

The Sisters of Mercy, of San Diego, California, will erect a \$75,000 hospital building.

The Sunningdale Country Club of Mt. Vernon, N. Y., will erect a \$60,000 club house, after the plans by Robert D. Kohn, 66 West 45th Street, New York.

The city of Halifax, N. S., will erect a school building costing \$125,000, after plans by W. J. Busch, of that city.

Mowbray & Uffinger, 56 Liberty Street, New York, have prepared plans for a new 4-story building for the First National Bank of Bradley Beach, N. J.

The Catholics of Normandin, Ontario, will build a \$125,000 church after plans by J. P. Ouellett, 28 Famille Street, Quebec.

The city of Lowell, Mass., will build an extensive addition to its high school. The plans being by Henry L. Rourke, of that city.

A Masonic temple will be erected at Newport News, Va., after plans by Ferguson, Calrow & Wrenn, of Norfolk.

The city of Clovis, New Mexico, is considering plans for a \$75,000 high school.

Leonard Ashlin, of Bridgeport, Conn., is preparing plans for \$100,000 public welfare building, at Washington and Madison avenues, in that city.

Bowling Green, Ky., proposes to erect a new city and county hospital.

The city of Pueblo, Colo., will receive plans about Dec. 1st for a new auditorium and city hall, to cost about \$220,000. The plans are by W. W. Stickney, of Pueblo.

St. Joseph's Congregation, of Fort Edward, N. Y., will erect a new church, costing about \$60,000, after plans by M. L. & H. G. Emery, Bible House, New York.

The George Burnett Company, of Waco, Texas, is preparing plans for a \$150,000 hotel in that city.

The Kenmore Hotel will erect a 5-story addition to its hotel building on North Street, Albany. The plans are by J. S. Shattuck, of that city.

Ralph H. Emerson, of San Antonio, Texas, has prepared plans for a \$100,000 high school building on Main Street, in that city.

The Phillips Exeter Academy will let contracts for a 10-story gymnasium and swimming pool at Exeter, N. J., to cost about \$100,000. The plans are by F. A. Coulby, 15 East 40th Street, New York.

The Lebanon University, of Lebanon, Ohio, is planning the erection of a two-story building to cost about \$100,000.

St. Stephen's Episcopal Church, of Wilkes-Barre, Pa., will erect a three-story parish house, costing about \$100,000.

The First National Bank, of Danville, Ill., will erect a twelve-story bank and office building, to cost about \$150,000. Bids will be received December 15.

St. Francis Hospital Association, of Huntington, W. Va., will erect a three-story hospital building, to cost about \$200,000. The plans are by Meaner & Sweeney, of that city.

The Ohio National Guard will erect a memorial hall and armory at Toledo, costing about \$65,000. Bids will be received December 1st. The plans are by Fred Elliott, of Columbus, Ohio.

The City of Beloit, Wis., is considering plans for a city hall.

The Lakewood Baptist Congregation will erect a church at Lincoln and Detroit streets, Lakewood, Ohio.

The City of Neodesha, Kan., is planning the erection of a \$200,000 high school.

Rose & Peterson, Kansas City, have prepared plans for a six-story jail at Wichita, Kan., to cost about \$100,000.

Walter Boschen, of St. Joseph, Mo., has prepared plans for an \$80,000 church building for the First Christian Congregation of that city. Bids will be received this month.

All of the bids for the erection of the new school building at Gloversville, N. Y., have been rejected.

The contract for the erection of a new club house for the Cartaret Social Club, of Jersey City, has been awarded to Wm. Robertson & Son, 15 Exchange Place, Jersey City. The building will cost about \$125,000.

Jacob Myers Sons Company, of Philadelphia, has been awarded the contract for the construction of four buildings for the Carson College for Girls at Chestnut Hill, Pa. The work will cost about \$300,000.

The contract for the erection of the new Indiana State Normal School at Terre Haute, Ind., has been awarded to A. W. Stoolman, Champaign, Ill., at \$82,180.

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#### Obituary Notes

Richard Thompson, for many years engaged in the blue stone industry at Sawkill, N. Y., died in Kingston during the past month, at the age of 76 years.

Charles A. Demichell, member of the granite firm of Schuh and Demichell Bros., of San Jose, Cal., died in that city during the past month at the age of 54 years. He was born in San Francisco, Cal.

Joseph C. Callahan, president of the St. Lawrence Quarries, Inc., of Gouverneur, N. Y., died on October 19. Mr. Callahan had been for many years engaged in the marble quarrying business and was well known to the trade.

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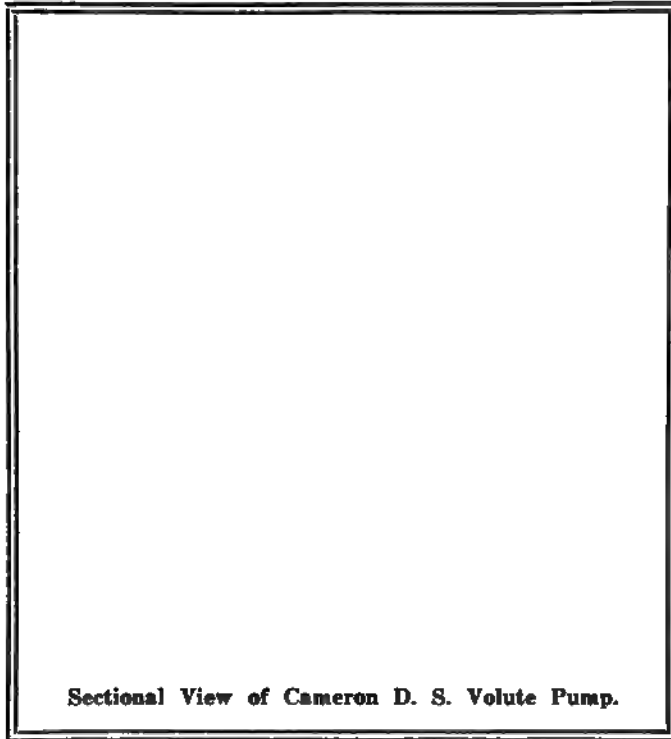
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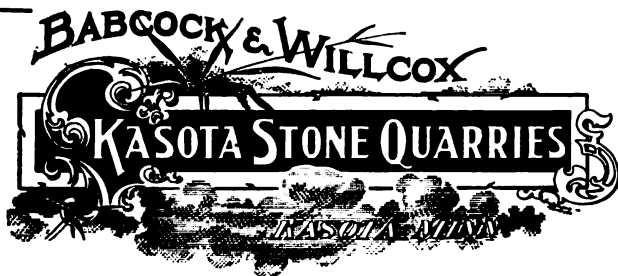
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## Origin of Dolomite



THE geologists have long held that the dolomites constitute one of the most interesting of rock formations. They have given long study to the various appearances of the stone and yet have been unable to come to any unanimous conclusion as to the manner in which the stone is formed. That portion of the Austrian Tyrol which bears the name of the Dolomites has been a favorite field of investigation for the geologist for more than a century. Inasmuch as dolomites, in one form or another, are extensively used for building and decoration, the nature and formation of the stone have a practical importance to the quarrying and stone-working industry. A very thorough and extensive study of the subject, under the above title, has been made by Francis M. Van Tuyl and appears in the annual report of the Iowa Geological Survey for 1914, which has just been issued.

The stone was named in honor of Dolomieu, a French geologist, who, in 1781, was one of the first to describe the peculiar magnesia-bearing limestone of the Tyrol. Since that time dolomite has been found to have a widespread distribution in both time and space and to constitute one of the most important rocks of the earth's crust. Field studies of the dolomite deposits were undertaken in Northeastern Iowa and adjacent parts of Illinois and Wisconsin in 1912 under the auspices of the Iowa Geological Survey and since then have been carried on at intervals in Southeastern New York, New Jersey, Vermont, Pennsylvania and other states. Normal dolomite consists of 54.35% of carbonate of lime and 45.65% of magnesium carbonate. But perfectly pure dolomite is rarely found in nature and it is often impossible to say where dolomite leaves off and limestone begins. At present the terms limestone and dolomite are very loosely used. It may be said, however that where the magnesium content is more than 10%, the stones are called in the trade magnesium limestone, but when the percentage of magnesium increases nearly to the normal the stones are called dolomites or dolomitic marbles.

As to the extent nature of the mixtures of calcite

and dolomite in all stages of the transition from limestone to dolomite little is yet definitely known. Mr. Van Tuyl suggests that it might be found convenient to designate all limestone containing magnesium in excess of three or four per cent and below the limit at which individualized dolomite crystals appear as magnesium limestones, while rocks above this limit which consist wholly or in part of crystals which behave as dolomite but which still contain less magnesium than normal dolomite, might be designated dolomitic limestones. The more restricted term dolomite could then be applied to those rocks which possess the two carbonates in approximately equivalent proportions.

The various geologists have advanced these theories to account for the origin of dolomite: primary deposition, alternation, and leaching. After considering at length all of these theories and the arguments that have been advanced in their behalf, Mr. Van Tuyl says there seems to be no escape from the conclusion that the great majority of the stratified dolomites have had their inception in the alteration of limestones. It will not be denied, however, that some dolomitic formations of minor importance have had a different origin. The more extensive beds of dolomite, there are many for believing, have all been formed beneath the sea, and dolomitization effected by ground water is probably only local and very imperfect.

From the practical point of view the dolomites have many admirable qualities that fit them for building and decoration. Magnesium is less freely acted upon by the atmospheric acids than many of the other rock-forming minerals, so that the dolomites weather well, as a rule. The only exception is where the magnesium is not generally distributed but occurs in flakes or crystals, as in this case the surrounding calcite may dissolve, allowing the harder crystals to fall out and thus present a pitted appearance. The importance of the dolomites in this country is shown by a list of those which have been commercially used to a wide extent. Among these are the South Dover, Tuekahoe, and Pleasantville marbles of New York State,



the Lee marble of Massachusetts, the Beaver Dam of Maryland, the Inyo of California, the White marble of Canaan, Connecticut, from which the Hartford Capitol was built, the Swanton marble of Vermont, the white marble of Avondale, Pa., and the Frontenac, Kasota and Mantorville limestones. The well-known Gouverneur and Glens Falls marbles of New York State are classed rather with the magnesium limestones than with the dolomites.

### Basalts and Lavas of Hawaii

None of the island possessions of the United States exhibit more notable points of interest for the observant traveler or the naturalist than the Hawaiian Islands. The natives are typical of the race inhabiting many island groups of the South Pacific, the plant life has the attractive features of insular development in semitropical latitudes, the marine life of the warm waters is wonderful, but perhaps the most fascinating, instructive, and awe-inspiring of all the natural phenomena of Hawaii are furnished by its active volcanoes. The whole group of islands, extending in a chain for many hundred miles, is of volcanic origin, though some of the islets and reefs are but the wave-battered remnants of volcanoes whose fires have long since died out.

Approaching Honolulu by steamer from San Francisco, the traveler has the evidence of volcanic action plainly before him in the first land he sees, in the ash cone of Koko Head and the well-preserved craters of Diamond Head and the Punch Bowl, which are in the outskirts of the city. The high mountains of the island of Oahu are also made up of black lava—basalt—but they are largely covered with vegetation, and one must go to the largest island of the group, Hawaii, for the wonderful demonstration of the process by which all these island mountains have been built up from great ocean depths. Kilauea, one of the most active, and Mauna Loa, one of the largest volcanoes in the world, are showing just how lava builds up mountains. Both of these volcanoes are included in the newly created Hawaii National Park.

Since the time of Captain Cook the Hawaiian Islands have been visited by geologists and others interested in the problems of volcanoes, and much has been written concerning them.

Professional Paper 88, "Lavas of Hawaii and Their Relations," by Whitman Cross, of the United States Geological Survey, Department of the Interior, presents a summary of what is now known concerning the lavas of all the islands. This paper is largely technical in its character, for it is intended primarily to serve as a basis for future study of the rocks by geologists.

It appears that there are many other kinds of lavas in Hawaii besides basalt, and many facts of association of the different lavas are of interest to students of the inner history of volcanoes. While much is yet to be learned concerning the lavas of these islands, Mr. Cross

shows that present knowledge of the rocks is sufficient to throw light on some of the most vexed questions pertaining to the origin and relations of the igneous rocks of the earth.

### A Suggestion as to the Welsh Quarries

A correspondent writing to the *Liverpool Post* with respect to the cry of the Government for more men suggests that there are certain industries which can, for the present, be closed altogether without any harm being done and he cites the slate quarries as a case in point. He says that there must be many thousands of ineligible and over-age men employed in the quarries of North Wales. "I am given to understand that these men," he says, "are paid at a very low rate of wages and that the stocks are accumulating because at present there is no demand for slates. After the war is over there will be a great demand for them and the accumulated stock will be sold at a greatly increased price, much to the advantage of the owners." He asks why munition works cannot be set up in these districts to employ the quarrymen and says that the latter would welcome such a scheme. All of the above is very interesting, according to the comment of the *Slate Trade Gazette*, but not very pertinent to the main point at issue, which is the demand for more men. If the Government want more men, they should look to the thousands of single men first, and they might, for a start, provide an example to the nation by setting their own house in order. What private firm has anything like the percentage of men sheltering under the big umbrella of exemption that the Government has?

### Another Concrete Collapse Attended With Loss of Life

Another concrete collapse, attended by loss of life, occurred in New York City a week or two ago. A brick garage was in course of erection, at the southeastern corner of Third Avenue and 64th Street. Workmen were engaged in finishing a heavy reinforced concrete roof. Without any warning this roof gave way, half of it falling to the floor below, broken into fragments, and the rest of it sagging down beyond all possibility of repair. The brick piers upon which it stood were also destroyed. One workman was killed and several others badly injured. The city authorities will investigate the matter, but it may be doubted whether they will strike at the root of the whole trouble and recommend a more reasonable use of this treacherous material. There is scarcely a city of any size in the country that has not had one or many concrete collapses, often attended with loss of life. There have been a number of them in New York City and yet architects and contractors are permitted to go ahead and put up concrete buildings that are a constant menace, not only to the workmen, but to the general public as well.

## Largest Mass of Stone Ever Quarried



NE of the largest masses of rock ever broken loose from its age-long resting place, so far as mentioned in any records of which we know, has just been shifted at the Blood Ledge quarry of the Bay View plant of the Rockport Granite Company. This is one of the many quarries at Cape Ann on the northeastern rock-bound coast of Massachusetts. The granite in this locality is found in various colors and is particularly suited for architectural work by reason of its soundness and beauty of texture. Quarries have been worked here for many years and the product has been used in fine buildings in all parts of the country. One notable use of the Cape Ann stone is in the great bowl of the fountain that stands before the Union Station at Washington, D. C.

The stone that figures in this great modern quarrying achievement is the Rockport Sea Green, which lies in monolithic shape. The company drilled twenty holes fifty feet deep, the holes being  $4\frac{3}{4}$  inches in diameter at the top and  $2\frac{1}{2}$  inches at the bottom. For the blast twenty-five kegs of Atlas powder were used. The explosion broke the great mass of rock loose from its bed and shifted it forward so that it can readily be broken into commercial sizes. The stone so quarried was about 100 feet wide, 100 feet deep and approximately 275 feet long. At a rough calculation it will be seen that this mass contained about two and three-quarter million cubic feet, weighing about 240,000 tons.

It does not need to be said that no use can be made of such a mass of rock in its present form. Even the ancients, who have astounded modern ingenuity by the magnitude of their engineer and building undertakings, would confess themselves helpless to handle a stone of this dimension. But it is now broken free and is ready to be quarried out in various sizes as may be required. The Rockport Granite Company, will use it largely in building work in base courses, columns, wainscoting, etc. We are presenting herewith a photograph taken after the stone had been shifted from its bed.

In this connection it is interesting to recall some of the wonders accomplished by the ancients as quarrymen and stone workers. Flinders Petrie, the explorer, found at Tonis, Egypt, the remains of a colossus which

had been 92 feet high and was a statue cut from a single block of stone. Some of the blocks in the walls of the Temple of the Sun, at Raalbek, measured over 60 feet in length, 18 feet in height and 12 feet in thickness. It will be remembered that one of these blocks was illustrated in these columns a few months ago.

### REMARKABLE BLAST IN A GRANITE QUARRY

Quarter of a Million Tons of Stone Shifted by the Rockport Granite Company at Cape Ann. The entire quarry face has been broken loose.

### An Imposing Granite Shaft

There is now being completed in Woodlands Cemetery, Philadelphia, a ninety-foot granite shaft in memory of Dr. Thomas W. Evans, a famous dentist of that city. A mausoleum at its base will hold the remains of Dr. Evans. The work is in the Empire style. The granite shaft is fourteen feet square at the base, and tapers to a square of about five and a half feet at the top. The mausoleum base contains six crypts. Dr. Evans amassed a fortune of more than \$4,000,000 before his death, about twenty years ago, and won fame as court dentist to Emperor Napoleon III, of France, and many of the crowned heads of Europe. The memorial shaft was provided for by Dr. Evans in his will, when he set aside \$100,000 for its erection. Litigation over bequests in the will, however, held up the work on the monument, which was not planned until a few years ago.

### Building Operations in Calgary


Building operations in Calgary are more active at present than at any time in the past two years. The most important work being done is the renovation of the Alberta Hotel into a number of business estab-

lishments (nine stores and one bank), writes Vice-Consul George E. Bell, from Calgary.

Inspector Fish, of the city building department, stated that he understood excavation for an armory to cost \$283,000 would be started in a few days. The owners of the Robin Hood Mills are arranging to build an office in connection with their mill at an estimated cost of \$27,000. A row of seven stores is being

constructed on the principal business street, and another is being built by the Merchants' Bank at the corner of Center Street and Eighth Avenue. The front of this latter building will be of stone, in keeping with the bank. Building permits to the extent of \$152,550 were issued in the city of Calgary for the year 1915, as against \$615,900 during the 10 months ended October 31, 1916.

## Will We Profit by the Past?

 JANUARY 1st is fast approaching and every producer and manufacturer must enter into the quiet of his office and analyze his books for the past year. If these books are accurately and systematically kept the results will be beneficial to the stone trade; if not, the conclusions are misleading and dangerous, inasmuch as they lead to false conclusions in basic matters that affect not only the operator involved, but do inestimable damage to his competitors. The effect of inaccurate bookkeeping is seldom to overstate, but by omissions to understate, so that the operator is led to assume profits his bank account does not show and to continue to do business at a loss, thereby keeping the price of his product below a safe and equitable basis. It is impossible to place too much importance on the question of comprehensive and systematic bookkeeping, for every manufacturing business—whether large or small—ought to know to the decimal of a cent what it costs to produce a given material, not alone in the completed state, but through every stage and department of its manufacture.

Stone and marble producers and manufacturers as a class seem loath to spend the necessary money and time to install a comprehensive system of cost records and employ competent help to keep them up. In this time of loose-leaf records the installation expense is slight and the results beneficial beyond belief. The moral effect of a properly kept system tends without question to higher and better production, or output, with the resultant decrease in cost and increase in profits. It is one of the traits of human nature to work better and faster when being watched; the cost system is the eye of the management and shows promptly all along the line what each department and individual is doing; if it fails in this, it is not a properly devised or comprehensive system.

The American marble and stone producers and manufacturers are far behind in the matter of cost data. Refer to any of the modern engineering handbooks, which are full of reliable information within reasonable limits of practically every branch of the

building industry, and you will fail to find any information relative to the business which we follow, so that we are all working more or less in the dark. Our ignorance in such matters—that is our inability to be able to give any accurate facts on our production where same are required—leads the buyer to believe that there are big profits in the business, and we are accordingly being offered work at figures below our original estimates, which we accept to our detriment because we have not sufficient data to know whether we are on the boundary line or on the dangerous side of it.

It is, of course, true that many of our larger manufacturers are keeping comprehensive books, and these remarks refer to the trade as a whole. In one district where there are eleven operators there is not one that is making a systematic effort to ascertain the correct cost of his product at this time. They say, "We kept a man on this work for a while six or seven years ago and found what our product costs and it is throwing money away to pay a man every month to verify his figures of the month previous." This, in the writer's opinion, is suicidal, and the fact remains that these same producers are getting the same price for their material as they did six or seven years ago, when every man who thinks at all knows that machinery of all descriptions, lumber, wire rope, steel, tools, in fact every commodity, has advanced, and still we say the stone business is not what it was in the past because of competition, when in reality the worst competitor we have is ourselves.

Again, accurately kept cost records and their knowledge will keep many a prospective operator from entering the field. It would be difficult to secure capital for new enterprises if the real cost of production were known. This is not a plea for the giving out broadcast information regarding one's business, but it is an appeal to every manufacturer that we ascertain correctly our costs that they may be used to our advantage when the time comes. How many producers today are al-

lowing anything for the depletion of their quarry, that is for the value of the stone before removal? The common practice is to consider the production cost without placing any value on the material in the ground, so that when it is all removed the property as an asset is wiped out.

This subject is so broad that one hates to leave it incomplete and the object of this article is that we may with the beginning of the new year look seriously on a very serious matter; that we may develop an accurate, comprehensive cost system, which shall have for its purpose the ultimate distribution of every

penny paid out, from the president to the office boy. This will lead to increased production, decreased cost, greater accuracy, greater confidence, and the days of guesswork will be over. We can then say with the Prophet, and I might add with profit: "Thus far can we go, and no farther." Now the question is, "If Smith can do it for that figure, I can do it, because I have more brains than he." Experience is generally bitter, but not bitter enough to keep us from doing the same thing next time. Will we go through another year as we have in the past, or will we profit by the experience of those who are keeping such systems?

## Oldest Stone Structure in the World



**C**ATTERED through the world are the remains of stone structures, in various states of preservation, that had their origin before the dawn of recorded history. Even on the Western Continent, in Mexico, Central and South America, are ruins showing the proficiency in stone working of the makers, of whom we know little or nothing. There are cyclopean walls in the old world that seem to have been erected by a race of giants, the very memory of whom has disappeared save for these monuments. But it may, we think, be doubted whether there is a single stone structure in any part of the world that antedates the pyramids at Sakkarah, Egypt, close to the ruins of the great city of Memphis. The oldest and most famous of the eleven pyramids standing on the Sakkarah plateau is that peculiar stepped and truncated pyramid called by Arabs Mastabat-el-Pharaoh. An illustration of this, presented here with,

### GREAT PYRAMID OF SAKKARAH, EGYPT

Probably the oldest stone structure in existence in the world. Built between 5,000 and 7,000 years ago.

shows how it is curiously built in stages or degrees. It is, of course, impossible to fix its date with any degree of accuracy, but the consensus of opinion is that it is the oldest large structure of cut stone that is now standing in the world.

All of the arguments as to the date of the great pyramid at Sakkarah, aside from the testimony of the structure itself, are based upon the declarations of Manetho. A priest of Lower Egypt, at the beginning

of the third century B. C., Manetho is the historian from whom most of our knowledge of ancient Egypt is obtained. The list of Egyptian dynasties is the most valuable remnant of the history. The dates appeared to have been derived from genuine documents including the sacred books of the Egyptian priests, and recent discoveries have vindicated his authority. Manetho says that Ouenephes, the fourth King of the First dynasty, built a pyramid close to the village called Ko-Komeh, and from tablets and inscriptions found in the pyramid and on the surrounding plateau, this structure has very reasonably been identified as

the work of Ouenephes. This would place its date somewhere between 3600 and 5000 years before Christ, the latter date being favored by the best of recent authorities.

The great Sakkarah pyramid is the largest in size next to those of Gizah. The degrees are five in number, diminishing in height and breadth towards the top. The present height from the base is about 190 feet. Contrary to the usual rule in pyramidal buildings, the

base is not a perfect square, the measurements, according to Col. H. Vyse, being 351 feet 2 inches on the North and South faces, and 393 feet 11 inches on the East and West. It is surrounded by what may be called a sacred enclosure, about 1750 feet by 950 feet. Inside, the construction is peculiar. Immediately under the centre is an excavation in the rock, 77 feet in depth and 24 feet square; the top of this is dome-shaped and was originally lined with wooden rafters; the bottom is paved with blocks of granite, and beneath is a rude chamber, the opening to which was concealed by a granite block four tons in weight. No trace of anything was found here when the pyramid was opened by Minutoli in 1821. Out of the excavation leads a very labyrinth of passages conducting to

different apartments. On the doorway of the one opposite to the entrance are some hieroglyphics, referred to above. The sides of these chambers had been lined with blueish green slabs similar to those now known as Dutch tiles; and it is scarcely necessary to remark that vitrified porcelain was a very old invention in Egypt, and continued in vogue there till a late period, even after the Arab conquest, and the foundation of Cairo. Pieces of broken marble and alabaster were found in some of the passages; and in a gallery connected with another entrance which appeared not to have been ransacked, were found 30 mummies of an inferior description, coarsely enveloped in wrappers. None of the other pyramids present anything worthy of notice.

## Riprap Loading Plant at a Rock Quarry



HERE has recently been put in operation by the Temescal Rock Company, at its quarry at Corona, Cal., a novel plant for loading riprap on railroad cars. The quarry floor from which all of this company's product is taken is located at an elevation of about 200 feet above the railroad tracks at the foot of the mountain. The crushing and screening plant for preparing commercial crushed rock consists of a large jaw crusher which will crush pieces of rock up to 10 tons and break it down to a maximum of 10" pieces, this product being delivered to a gyratory crusher, which in turn delivers its product to two disc

third rail. By a system of levers located in a tower over the initial crusher and operated by one man, the empty cars are sent to the steam shovel, and the loaded cars returned to the initial crusher, into which their loads are dumped by means of an automatic crane. The cars do not require an operator other than the one located in the tower.

For loading the riprap it was decided to modify the system of haulage in use to the crusher by introducing an additional system of tracks and an incline railway. The method of loading the riprap is by the use of the steam shovel which loads the cars for the crushing plant. In actual operation there are always two of the electric cars alongside of the shovel, the forward one to be loaded with rock for the crusher and the rear car to carry the riprap to the incline.

The riprap cars are of the same general design and construction as the cars which feed the crusher, excepting that they carry skips into which the riprap is loaded. Each of these skips has a capacity of 10 tons of riprap, and the steam shovel loads either the skip on the riprap car, or the car which feeds the crusher, depending upon the size of the material which the steam shovel may reach.

The incline for lowering the riprap consists of two tracks leading from the quarry floor to the railroad tracks at the foot of the mountain. These tracks carry transfer cars operated in balance by a large hoist located on the quarry floor. The transfer cars are so designed that the riprap cars may be run on same at right angles to the incline. The tower operator brings the car from the steam shovel to the transfer car, where it is automatically locked by a system of latches, and lowered to the foot of the incline, the other transfer car with the empty riprap car being hoisted at the same time. While the skip at the foot of the incline is being unloaded, the empty car at the

### SHEAVES FOR A WIRE-ROPE HOIST

A feature of the equipment of a large riprap quarry on the Pacific Coast with novel method of handling the product

crushers. The jaw crusher is located just below the quarry floor, and the gyratory crusher and the disc crushers below same, so that the rock from the time it is delivered to the initial crusher, is allowed to run by gravity to the screening plant at the bottom.

The rock is shot down in benches and is loaded by means of a 100-ton steam shovel into a system of cars fitted with motors which receive current from a

tops is run under the steam shovel, where it receives a fresh load. The unloading of the loaded skip at the bottom is accomplished by means of a Lidgerwood 15-ton combination guy and stiff-leg derrick operated by a Lidgerwood 52-horsepower double-drum electric hoist with swinging gear. The incline tracks diverge sufficiently so that the derrick is placed between them, and thus serve both tracks. When the loaded skip reaches the bottom, the derrick picks same up, swings it around over the railroad car and lands it on same. The forward bails of the skip are then loosened and by raising the rear of the skip the riprap is gently deposited on the railroad car. This action is so smooth that it does not damage the railroad car floor in any way, and the entire operation of unloading the skip and returning to empty car requires  $2\frac{1}{2}$  minutes. While the car which has just been unloaded is returning to the top of the incline, the operator swings the derrick over the opposite track and is ready to receive the loaded skip from same when it reaches the bottom. There is therefore, practically no loss of time, and it requires only four minutes from the time a loaded car is received at the bottom until the next car arrives there, the running time from the top to the bottom being about  $1\frac{1}{2}$  minutes.

The incline is approximately 300 feet long, the grade being about 57.3% from the horizontal. The weight of the transfer car plus the skip is approximately  $7\frac{1}{2}$  tons, the load which the skip carries 10 tons, the rope speed 300 f. p. m. and the rope used is of plow steel grade  $1\frac{1}{2}$ " diameter.

The hoist which controls the cars is a Lidgerwood special single fixed-drum arrangement having a drum 66" diameter with 42" face, which is equipped with 80" diameter post brake, hand operated, to be used in emergency cases and for locking the cars in position at the top and bottom terminals. The ropes are wound over and under in the same grooves, the two ends being fastened at either end of the drum. The gearing throughout is of cast steel, there being two reductions. The bedplate is of massive construction of cast iron, and the electrical equipment consists of a Westinghouse 100-horsepower continuous rated motor with drum controller and a suitable bank of hoist resistance. There is also provided a geared limit switch for bringing the cars to rest in case the operator should fail to do so. While this is a gravity installation, the motor was installed to take the place of a mechanical brake. This motor, while being overhauled by the descending loaded car, automatically acts as a generator and returns current to the lower line; this therefore dispenses with all of the heat, which would have to be dissipated by a mechanical brake, and provides for absolute safety at all times. The design of the motor is such that the speed at all times is absolutely uniform and only exceeds by a small amount the motor synchronous speed. There is further pro-

vided an electric brake set by dead weight and released by solenoid, which is wired into the first notch of the controller on both sides of the off position. In case of current failure the solenoid brake would bring the cars to rest at any position on the incline, and when the geared limit switch acts it cuts off the current and applies the solenoid brake, thus bringing the entire system to rest. The power supply is alternating current at 3-phase, 60-cycle, 440-volts.

For leading the rope from the cars to the hoist a

INCLINE IN A ROCK QUARRY  
Gravity installation in a Pacific Coast Quarry for  
handling riprap

system of large steel sheaves has been installed. These provide for absolute fair leads at all times. There has further been installed a complete set of spring buffers at both the top and bottom of the incline to absorb any shock which might result from making the landing.

### Analyses and Assays of Rocks

The question is frequently asked of the United States Geological Survey, Department of the Interior, "What is the difference between an assay, an analysis, and an expert examination of a specimen of rock or mineral—such a specimen as may be sent to the Geological Survey by any one who has found or thinks

he has found a valuable mineral?" Most of the Survey's correspondents ask for assays of their specimens, others ask for analyses, and few appear to distinguish between the two. The Geological Survey can make neither an assay nor an analysis for private parties; it can, however, make a visual inspection of a specimen, or it can make a simple chemical test to determine whether the specimen contains a commercial amount of some valuable mineral, such as potash. Ninety-nine out of every hundred specimens submitted to the Survey are found to be commercially valueless. Such an inspection or test, however, is widely different from an analysis. A complete analysis of a rock that is composed of many different minerals may require more or less continual attention of a chemist for a month or six weeks, and such work is done by the Survey only in connection with his own scientific inves-

tigations. An assay, on the other hand, is usually a fire test made to determine the exact metal content of an ore specimen. The Geological Survey makes no assays for private parties.

The Survey has recently reprinted its Bulletin 422, by W. F. Hillebrand, entitled "The Analysis of Silicate and Carbonate Rocks." This is a revision of Bulletin 305, which was so highly valued in Germany that it was there translated and republished. It contains a detailed description of the analytical methods employed in the laboratory of the United States Geological Survey and represents the experience gained in the analysis of more than a thousand igneous rocks alone. These analyses have been carried to a degree of completeness previously unknown, by methods that have been carefully tested and proved, some of them devised in the Survey.

## Prospecting Marble Deposits

**M**OST marble beds outcrop in long and narrow bands, which may extend for many miles, writes Oliver Bowles in "The Technology of Marble Quarrying," issued by the Bureau of Mines, Washington. These bands represent truncated edges of folds in the rock and may be curved or straight, depending upon the topography and on the nature of the fold. Much of the rock surface may be covered with gravel, sand, or clay to a considerable depth. The geologist may, by a careful study of outcrops exposed here and there, obtain a knowledge of the chief structural features, and may thus determine the position, thickness, and attitude of the marble beds with a fair degree of accuracy, even if they are entirely hidden by surface debris. If geologic maps of marble belts are carefully made they are of inestimable value to the marble prospector. By accurately locating himself in the field and carefully consulting a geologic map the prospector may determine the position of marble belts beneath the soil and know something of their extent and attitude although they are unseen. It is important, therefore, that all available geologic maps of the region be consulted freely.

Knowledge of the suitability of any particular site can be gained only by detailed prospecting including a determination of the depth of overburden and of surface alteration of the rock and of the extent, quality, impurities, and soundness of the deposit. It is extremely unwise to proceed with development work without a reasonable assurance that an available mass of sound and attractive marble is sufficiently uniform in quality and abundant in supply for profitable exploitation.

The depth of stripping necessary may be determined at small cost by putting down drill holes. The need of

such preliminary tests should be recognized. In certain instances stripping has been attempted without any previous investigation of the depth of soil to be removed. The great loss that may result from thus working blindly may be illustrated by one particular instance. A pit opened by a certain quarry company and later abandoned is 60 by 80 feet in extent and 20 feet deep. To make such a pit required the removal of approximately 3,550 cubic yards of soil, which, at an average cost of 25 cents per cubic yard, would have cost \$887. The only purpose this pit actually served was to show the owners that the stripping was too deep to make quarrying at this point profitable. The same information could have been obtained by projecting two drill holes each 25 feet deep. At the ordinary cost of rock drilling, \$2 per foot, the cost would have been only \$100, a saving of \$787.

In estimating the necessary cost of stripping for a new quarry the attitude of the marble beds must be taken into account. If the beds are flat a greater area of rock must be uncovered than if they are steeply inclined or vertical.

Naturally conditions relating to disposal of stripping are of great importance. In certain places it is a matter of some difficulty to find a suitable place in which to deposit the soil that must be removed; in other places the soil may be carried to neighboring valleys or low-lying areas.

Surface observations are of great value, especially as regards jointing. The process of weathering tends to emphasize all unsoundness and thus facilitates the study of joint systems. Exposed surfaces may also permit a determination of dip and strike and the thickness of the beds.

In determining the quality of a marble deposit a



study of uncovered knobs or ledges should not, however, be deemed sufficient. On account of surface weathering the top rock may differ materially from the deeper parts of the deposit. Moreover, the number and spacing of joints at the surface may be no indication of the prevailing conditions at depth. Before the prospective quarry operator installs expensive derricks and hoisting machinery, and purchases channeling machines and drills he should have a fair idea of the quality and soundness of the marble and the supply available. In order to obtain this knowledge drill cores should be taken at several points.

The ordinary diamond drill will give the necessary information regarding color, uniformity, and general appearance of the stone, and also the extent of the formation. It will not, however, give definite information concerning the dip and the strike or the unsoundness of the marble. If drill cores come out in long, unbroken sections which show no indication of cracks, it may be assumed that the rock is fairly sound. If, on the other hand, the core is in short sections, the rotation of the drill will in most cases have so worn and rounded the broken ends that it will be impossible to determine whether the breaks are due to natural planes of weakness in the rock or to the process of drilling itself.

A method of prospect drilling that has been employed by at least one operator involves the use of the double core-barrel drill that was designed primarily for drilling bituminous coal, and operates in such a manner as to bring out a core from a delicate material with a minimum of breaking or other damage. The drill consists of an outer and an inner tube. The outer is attached to the drill rod by means of the core-barrel plug, and is rotated the same as the cutting tools. The inner tube is suspended by a ball-bearing plug at the top and centered by a ball bearing near the bottom. Thus, while the outer tube revolves, the inner tube which carries the core ring or lifter at its lower end remains stationary. The core passes up through the bit into the inner barrel, where it is protected from friction from the rotating parts, and from the washing action of the water. An ample water supply is provided between the two tubes. The purpose of the inner tube is to hold the core as immovable as possible, and thus to prevent the wearing or rubbing of the broken ends. Although the core does not revolve after it passes through the core lifter into the inner tube, the principle of cutting and the action of the bit on the core until after it passes into the inner tube are just the same as with the single-barrel drill. Therefore, if a natural parting is encountered in the rock, or if for any reason the core is broken off, it is liable to be rotated somewhat before it gets into the inner tube. If the core breaks obliquely the danger of rotation is minimized. Cores should be at least  $2\frac{1}{2}$  inches in diameter.

The use of a drill that described enables the pros-

pector to judge the unsoundness of the marble at points beneath the surface. If one examines carefully the ends of the sections of drill core one can, almost without exception, interpret the breaks, and state whether they are due to natural joint planes in the rock or to the process of drilling. If the cores are properly oriented, the proximity and direction of all

#### FOOT OF THE INCLINE

Portion of a unique equipment in a Western rock quarry for handling riprap stone

natural cracks in the rock in the immediate vicinity of the drill holes may thus be ascertained.

If the marble deposit is well exposed, the dip and the strike may be determined from examination of the outcrops. If, however, it is completely buried, these features may be determined from the drill cores if they are carefully oriented.

#### New Jersey's Stone Production

According to information obtained by the New Jersey State Department of Conservation and Development, under direction of the State Geologist, working in co-operation with the United States Geological Survey, the total value of the stone production in New Jersey for 1915 was \$1,612,061, an increase of \$64,288 over the production for 1914. Trap rock leads the list with a value of \$1,281,545. In order, the other varieties of stone follow: Limestone, \$159,549; granite, \$95,986; sandstone, \$63,964, and slate, \$11,017. The leading counties, in order of production, are: Somerset, Hunterdon, Passaic, Essex, Hudson, Mercer and Bergen.

#### "The House That Vanderbilt"

Edmund Clarence Stedman, whose writings adorn American literature, once published a poem entitled "The House That Vanderbilt." Commodore Vanderbilt, who was descended from one of the original Dutch settlers of Flatbush, founded a family of which there are many living representatives, and his son, William H. Vanderbilt, built a house which, for a third of a century, has been a landmark of New York, says the *Brooklyn Standard-Union*. In fact, it is one of twin



houses which form a striking architectural adornment of Fifth Avenue in the section where mansions seek to stay the rising tide of commercial structures.

It was William H. Vanderbilt, whose alleged or apocryphal statement, "The public be damned," has had as wide currency as any utterance of a business man, who erected on the block between Fifty-first and Fifty-second streets, just north of the Cathedral, on the other side, the remarkable Vanderbilt houses; one for his own occupancy and the other for his two married daughters; one of whom becoming a widow sold her part to her sister, whose family still occupies it. The original expenditure on the two buildings and their site was \$3,000,000. Save for the magnificent marble mansion of A. T. Stewart at Thirty-fourth Street nothing so costly was then known in the metropolis.

Now half a million more is being expended by the present Cornelius Vanderbilt upon remodeling and refitting the more southerly of the two houses—the one his uncle had occupied—and he designs it for the permanent home of his family. He will remove to it

from his present home between Fifty-third and Fifty-fourth streets, thus going a little downtown. William H. Vanderbilt, long president of the New York Central and Hudson River Railroad and of other great corporations, only lived four years in the brownstone house he built. He left a life interest in it to his son, George W., and after his death to the eldest son of his brother Cornelius, the present Cornelius.

George Vanderbilt sought to remodel the house by placing a large porte cochere on the Fifth Avenue side, but the city authorities would not permit of it and in the widening of Fifth Avenue a part of the property front was taken. Henry C. Frick, who secured a long lease of it after Mr. Vanderbilt closed it, made many changes, the chief of which was the erection of a high wall to shut off the house from the street. It was the hope of William H. Vanderbilt that the house would remain the home of Vanderbilts, and he provided as far as possible for its permanent occupancy. The amount now being expended on the structure is the largest ever put into remodeling a home in the metropolis.

## Stone in Road Improvement

By J. B. STONEKING, M.E.



HERE is such a heavy increase of traffic on all roads in this country, more especially on the main trunk highways between cities and towns of importance and the roads leading from the more populous country districts into the markets, that a very necessary and radical change has been forced in road-building and improvement methods. Not many years ago, plain graveled and water-bound macadamized roads stood the wear and tear of the then comparatively light and slow-moving vehicles. Light surfacing was the rule and materials which would stand up under that traffic were found to be inadequate when subjected to the abrasion and hard pounding of our heavier and rapid-moving vehicles of the present day.

Since the development and perfecting of the auto truck for hauling and delivery purposes, the slow, wide-tired wagon has been largely replaced. This type of traffic has spelled the doom of earth roads, and tears holes in lighter, more easily worn surfacing with amazing ease and rapidity. It has also caused a cry to be raised for easier grades. The lighter pleasure automobile is almost as hard on road surface as the truck, and the higher speed has increased the number of bad accidents on sharp curves and steep grades. These causes have not only made a heavy, wear-resisting road surface necessary, but in the rebuilding and improvement now being done the roads are widened,

grades reduced, sharp turns and dangerous curves eliminated.

The vast amount of work to be done, coupled with the high cost and shortage of labor, has led to the development of successful labor-saving road machinery of many different and highly specialized types. One of the labor-savers adopted from quarry, railroad, and mining work and applied with success to road building is the low-freezing, slow-acting, heaving, low-grade dynamite for earth work in deepening and widening cuts, widening curves around hillsides and points, blasting out stumps, boulders, and trees, and in making side and outfall ditches for drainage. Considerable saving is accomplished by its use in loosening material in conjunction with steam shovels, graders, scrapers, and other machinery.

After a good earth bed has been prepared, the type of road surfacing best adapted to local feasibility and traffic conditions should be applied. Each type of road has its particular advantages and disadvantages, and local conditions must govern the selection, frequently combining parts of each type.

Macadamizing is probably the oldest and most widely used method of surfacing, having more modifications than any other type. It consists primarily of crushed stone or gravel held together with some form of applied "binder." This type of road is most generally the cheapest in first cost and holds up well under the

#### A STRIKING MARBLE DISPLAY

A portion of the showing of new American and Foreign marbles made by the Tompkins-Kiel Co., in Chicago

lighter traffic. Heavy traffic, however, soon breaks through, making a high maintenance cost, hence it is not suitable for use as city paving nor on main roads near the larger cities and markets.

Crushed stone having sharp edges is a more satisfactory material than round-edged gravel, for it compacts with less "creeping," and gives a better binding. Trap rock, diabese, basalt, porphyry, and other fine-grained rock are very good on account of their hardness and wearing qualities, although somewhat low in "cementing" quality. Granite is usually too coarse-grained, and limestone too soft for a first-class road surface. A small amount of limestone is frequently mixed with the harder rocks to increase their cementing effect. The binders used are fine stone screenings and water, sand and water, limestone screenings and water, or clay and water.

Upon the compacted earth foundation is spread a layer of broken stone of sizes between one or two and one-half inches in diameter. This is rolled and re-rolled until it is well compacted; a thin coat of binder material is spread over this and rolled into the interstices of the larger stone. Next a coating of finer material of one-half inch to three-quarter inch is rolled, on top of which is spread and rolled very thoroughly a finishing coat of binder, using water freely. The finished sub-base of coarser stone is usually about four inches thick and the surface coat two inches, thus making a six-inch pavement.

In bituminous or asphaltic roads, the crushed stone sub-base is coated with a small quantity, approximately one gallon per square yard, of asphalt cement or tar, then the surface course, consisting of three-

quarter to one inch stone, which has been heated and thoroughly mixed with asphaltic cement, is spread on and rolled while hot. A thin dusting of sand or stone screenings is spread on top to keep the surface from running and becoming sticky. Often a concrete sub-base is used with the surface left rough purposely to prevent the creeping of the surface course. This type of road has a certain "springiness" which saves the horses' hoofs from too much jarring, it is easily repaired, the surface is not easily abraded, but it has the disadvantage of disintegrating after a length of time due to the presence of a certain amount of volatile oils.

A modification of the bituminous and asphalt road is the oiled road of California. A quantity of broken stone or gravel is spread upon the soil surface and thoroughly sprinkled with a light, crude asphaltic oil, then the whole is plowed to a depth of from six to eight inches, thus mixing soil, stone, and oil. It is then rolled with a roller having foot-like projections which work like a sub-surface packer in compacting the material from the bottom upwards, frequent harrowing and oil sprinkling being done as the rolling progresses until the surface becomes smooth and firm. Light oil or tar sometimes is used to sprinkle macadam roads and the surface dusted with fine screenings, hoping thus to eventually secure an asphaltic road through the penetration of the oil into the stone sub-base.

#### Rhode Island Granites

The United States Geological Survey has on hand for free distribution a number of copies of Bulletin 311—The Green Schists and Associated Granites and

Porphyries of Rhode Island. As indicated by the title, the report is technical in character and would probably not be of interest to others than geologists and petrologists. It contains a good geologic map of the area and is further illustrated with figures showing the structure of some of the crystals mentioned.

### Blasting With Liquid Oxygen

The following account of blasting with liquid oxygen refers chiefly to salt mines, but has some points of interest for mining and quarrying in general. In 1915 experiments with liquid oxygen cartridges were energetically taken up by the salt works at Winterhall, acting in conjunction with the famous potassium salt mines of Stassfurt and other localities, and considerable progress has been achieved. The cartridges are simply made of texture, paper, or cardboard, and are charged with soot or charcoal, mixed sometimes with other ingredients, or with kieselguhr and petroleum. The soot has answered well. A cap of fulminate of mercury is generally added for ignition; this cap should not be rigidly connected with the cartridge, to facilitate impregnation of the carbon. The Marsit cartridge does not need any cap. Ignition is by fuses or by electric wires; Dr. Hecker is said to have devised suitable ignition devices which do not require the instantaneous ignition of all the cartridges in a circuit. Impregnation of the pre-cooled material may be effected either by pouring the oxygen into the cartridge through a tube of filter paper (Baldus and Kowatsch), or by immersing the cartridge in the liquid; the latter procedure is preferable. The oxygen should be of high concentration, 99 or 97 per cent. The immersion of a cartridge takes from five to twenty-five minutes. The experiments seem, at any rate, to have established several important facts. A cartridge can be so impregnated that it will still explode 10 or 15 minutes after being tamped in its hole; means have even been found by which cartridges could be impregnated at the surface and be taken down and used as much as three hours later. This is not considered important for salt mines, because the general conditions there demand that many appliances should be kept below. But the fact that not more than two men are required to look after up to twenty blasts would be important. Glass vessels or bottles were first tried for the transport of the liquid oxygen; but some unpleasant experiences were met with, and the transport vessels and immersion vessels are better made of metal. A hole may require two litres of liquid oxygen. The immersion cylinders at Winterhall have a diameter of 25 cm. and 38 cm. height; but big cartridges, 32 mm. in diameter, are sometimes used, and as many as five cartridges are fixed in one hole of a depth of 150 cm. This great depth of the bore-holes is characteristic of salt blasting. Heberle estimates that one blast would cost \$3.50, counting materials and labor. That would

not be cheap, and, he adds, moreover, that conditions may be less favorable elsewhere than they are at Winterhall. The actual dearth of explosives during war time may be a factor in these attempts.

### How Deep Water Penetrates in Rocks

The more porous beds of sand and gravel along stream valleys, lake shores, and the coast absorb very large amounts of water. Next to these unconsolidated deposits the rocks capable of direct absorption are sandstones and certain porous limestones. The absorption by granites, slates, and other massive rocks is relatively slight, according to the United States Geological Survey, Department of the Interior. A cubic foot of sand will absorb on an average about 10 quarts of water, and certain porous sandstones will absorb 2 to 6 quarts. While there is no definite lower limit to the penetration of water, it is probable that little surface water penetrates more than 3 miles below the surface, and most of the pores and crevices in rocks are closed below the depth of a few hundred feet.

### South African Marble Quarry

The quarries near the Cape Town docks are worked by convict labor obtained from the Breakwater Convict Station near by. The majority of these men are Kaffirs, with a few white men, serving their sentence for illicit diamond buying. The hours of duty are 10 a day, and the sameness of the life has in many instances a serious effect on them. The men who attend to the blasting are good conduct men, who are allowed privileges for doing this work—one of these is an allowance of tobacco, another is the right to have the snakes which are often found after the explosion. Snake's gall is an excellent medicine, according to the Kaffir theory, and this privilege is more highly prized than that of the tobacco. Few attempts at escape are made by the natives, but white men have made such attempts from time to time, but without success. The natives, however, try to shirk work very often. The quarry gangs are kept separate from the other prisoners. As a man gets towards the end of his sentence, he is, if his conduct has been good, removed from the gangs, and joins the general workers, whose lot is easier. In the morning, when the men parade, the sick call is made, and those who are ill fall out. The arrival of the sick men is always hailed with a burst of derisive laughter from the others, in which the malingerers themselves invariably join.

### British Columbia Marble

Among the many natural resources of British Columbia available for commercial and industrial purposes is a fine grade of marble. An extensive ledge of what is designated as Malaspina marble is now

being worked on Texada Island, about fifty miles northwest of Vancouver. It is a crinoidal formation, its most attractive feature being the variety and extent of tints and coloring shown in irregular streaks. Marble from the Texada quarries was used for decorative purposes in the new Vancouver Hotel, completed in 1915, and samples exhibited at the Panama-Pacific Exposition at San Francisco attracted favorable attention. The deposits are found in the southern end of the island adjacent to a land-locked bay, which facilitates the transportation of the product to markets on the mainland.

### Limestone Flux Prices Up

A Youngstown, Ohio, correspondent writes as follows: Limestone producers of the lower Mahoning valley district will receive a substantial increase in price for their product next year as compared with prevailing prices. Blast furnace operators consume the greater part of the limestone produced in the district and they will be called on to pay an advance amounting to about 15 per cent. Receipts of limestone producers will be increased several hundred thousand dollars as a result of this price advance. Most 1916 limestone contracts will stipulate a price of 85 cents a ton as compared with 70 or 75 cents a ton this year. About 4,000,000 tons of limestone are produced in the section of the valley below Lowellville.

Limestone produced in this section has for a competitor stone coming from the Kelley Island quarries. The latter stone can be mined more easily than that in this section and is therefore an active competitor of the product of local quarries. The larger freight rate on stone from the Lake shore quarries into this valley leaves the advantage with producers hereabouts. Limestone produced in the Mahoning valley ranges from 90 to 95 per cent. carbonate of lime.

### Rocks Absorb Water

The amount of water held in the rocks or other materials composing the earth varies greatly, owing to many causes. The amount absorbed depends on the porosity of the material, the slope of the surface, and the size and abundance of joint cracks, fissures, and cavities. The amount of water in drift or surface materials is dependent to some extent on the nature of the underlying rock, and the amount which finds its way into the solid rocks is dependent on the thickness of the overlying surface deposits. The amount of water contained in the earth's crust (to a depth of 3 miles) has been estimated by different writers with

widely different results. A recent estimate is given by Fuller, of the United States Geological Survey, Department of the Interior, who concludes that the total amount of free water in the earth's crust would be equivalent to a uniform sheet over the entire surface of the earth having a depth of about 100 feet. This is but a small fraction of the estimate made by other writers.

### American Slate Abroad

How the trade in Great Britain feels towards the possibility of using American slate in that country is shown by the following comment from the *Master Builder*: It is suggested that there should be a moderate tariff on imported foreign slates. This would do no harm to anybody as slates which are brought from abroad are usually of inferior quality. It is chiefly by the test of time that roofing material can be tried, and slates which are rejected abroad find a welcome here where cheapness is the only recommenda-

### A CONCRETE BRIDGE THAT GAVE WAY

Ruins of the \$100,000 concrete structure built at Sloan's Ferry, N. C., by Mecklenburg and Gaston Counties. Catawba River floods wrecked it.

tion. In the United States, prodigious efforts are being made to increase the output of slate quarries to meet the demand which is likely to ensue after the war, and as they have prospered by our suffering they can easily afford to pay a reasonable impost. The other large slate-producing country, France, will need all its output for its own use, and so will Belgium. Although there has not yet been much destruction of property in Germany by the war there are considerable arrears of building to be made up, as the normal construction of about 200,000 houses a year has been almost completely stopped. Thus, except in the one direction referred to, the outside supplies of slates are not likely to be considerable. There is, of course, the question of artificial substitutes, but that cannot be dealt with here; only one may be permitted to say that the durability of natural slate shown through hundreds of years must always be a considerable factor in its favor.

# STONE

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THE next annual convention of the International Cut Stone Contractors' and Quarrymen's Association of North America will be held at Atlantic City, N. J., on Wednesday, January 17th, 1917. The meeting will be called to order at the Traymore Hotel, and a very interesting program has been arranged for the various sessions. Atlantic City is the best of winter convention cities and the social features are sure to prove most attractive. It is confidently expected that this will be one of the largest and most successful gatherings in the history of the organization. Aside from the renewal of good fellowship, so vital in any industry that is to progress, there are important questions affecting the entire stone trade that will come up for discussion and settlement. Every member of the Association should be present and there should be a large list of applicants for membership.

THE prosperity of the American farmer has been a prolific subject for jokes to the newspaper paragraphers for some years past. Statistics that cannot be disputed show how widespread is the possession among them of automobiles and other luxuries of the well-to-do. Now it appears that they are making a good use of their hard-earned dollars in the erection of costly memorials to their dead. A prominent marble and granite dealer of Central New York says: "There was a time when the only people who would spend more than a few dollars for a monument were the city folk. Oftentimes they ordered large memorials and statues to be placed in country cemeteries near their native homes, or near the family residence. Now the residents of these small places are doing likewise. They have wanted for many years to be able to

erect suitable memorials and now they are taking advantage of the possibilities." In this connection it is interesting to note the steady advancement that has come about in recent years in the standard of taste shown in cemetery work. A memorial that violates every canon of art is now the exception rather than the rule. A large share of the credit for this change must be given to the trade press, which has ceaselessly and intelligently sought to bring monumental art to a higher level.

THE most rabid of concrete advocates always become apologists when they speak of the manner of doing the work. There are always a hundred and one causes that may contribute to failure in the use of this most peculiar material. A Winnipeg engineer says: "Of the valuable properties reinforced concrete may possess, few will exist if the work is not properly designed and executed. The latter is quite as important as the former, for if the greatest of care is taken with the design and careless supervision given to the construction, the result may be as bad, or probably much worse, than if the work was badly designed. In fact, a poor design well constructed may give a much better result than a good design badly constructed." The ordinary man will find it hard to work up enthusiasm for such a material.

IN another column we publish an article that discusses a subject of the utmost importance to all quarrymen and stoneworkers of the country,—cost-keeping in an intelligent and systematic manner. It is written by a man who is very prominent in the trade, and who is noted for his progressive spirit. There can be no disputing his conclusions. It is surprising how few stone companies have installed a comprehensive and reliable cost system. It is possible that they may, at some time, have given a study of the various elements of cost, and they use this as the basis for present-day figuring, without taking carefully into account the shifting prices of labor and supplies. It may be suspected, however, that many more companies have never made any regular computation, but endeavor to arrive at costs by some rule of thumb. On more than one occasion we have said that the stone industry is suffering, not from lack of business, but from unwise competition and the taking of contracts without the absolute assurance of a fair margin of profit.

A NEW JERSEY newspaper advocates the use of wood blocks for pavements in its city. It says: "Wood blocks may not be quite so durable as stone, and city engineers sometimes hesitate before recommending them. The merchants, however, cannot be blamed for demanding the noiseless pavement of wood. The day of the noisy stone pavement is rapidly passing." One may freely grant that noisy stone pavements are no

longer desired, and yet not become an advocate of wood or asphalt paving. The solution of the problem is to lay stone paving that shall not be noisy. This is not a difficult proposition. If the blocks are well made, are laid with close joints on a firm and durable foundation, and are then carefully grouted, they will not prove noisy at all. What is more, they will give a firm foothold for horses, and will outlast any other form of paving known. Another objection urged against stone black paving by this newspaper is that they are dusty, because it is impossible for the street cleaners to remove the dirt from between the blocks. If the pavement is properly laid, there will be no cracks to harbor dirt.

AN English paper devoted to one branch of the building industry sees a measure of compensation for the dullness that has affected that trade for a number of years past in the fact that an immense number of new houses will be needed after the war. The writer thinks that half a million will not be wide of the mark. "Before hostilities broke out, we were considerably in arrears. Since then, the pace has got slower and slower, and both these factors have to be compensated for. On the other hand, it is a melancholy fact that thousands of young fellows who would have been establishing homes within the next few years have gone to that 'bourne from whence no traveller returns,' and this will reduce the number required. As a set-off to this, however, there has been a very striking increase in the number of marriages since the war began. The number has gone up from 286,370 in 1913 to 360,206 in 1915." A great increase in building activity is certainly due in this country, without regard to the duration of the European war. Our prosperity during the past two years has been so unparalleled as almost to alarm the economists. The enormous fortunes that have been made are almost without number. Indications would point to a remarkable demand, not only for factories and business buildings, but also for a great many costly residences. The new year will open in a promising way for the stone industry of this country.

### Building and Stone Work in New York

The demand for labor in New York State is constantly growing and the wages paid are more than keeping pace with the development. The Department of Labor has just issued a review of the labor market for September, from which it appears that, as compared with August, there was an increase of four per cent. in the number of employees and of six per cent. in wages. The reports come from a survey of 1,500 representative firms with more than 500,000 employees and a weekly payroll of more than \$8,000,000. As compared with the situation in 1914 the number of men at work increased twenty-one per cent. The average weekly earnings this year are \$14.86; in Sep-

tember, 1914, they were \$12.85. In the stone, clay and glass products, which are classed together, a new high record is made, with an increase of five per cent. in wages.

The report of the building work in the State for the month of September shows some interesting figures. As compared with September, 1915, there was a marked increase in building activity in six out of the ten leading cities of the State, while four showed a decrease. The percentages of increase were as follows: Binghamton, 38.8; Buffalo, 30.0; Rochester, 17.6; Schenectady, 76.1; Syracuse, 79.4; Utica, 108.9. The percentages of decrease were as follows: Albany, 36.7; New York, 22.7; Troy, 87.0; Yonkers, 35.1. The decrease in New York City was apportioned among the boroughs as follows: Manhattan, 23.3; Brooklyn, 16.8; Bronx, 40.5; Queens, 13.7; Richmond, 48.8. The total estimated cost of building work in the ten cities for September, 1916, was \$11,765,277, as compared with \$13,814,199 in September, 1915.

The Merchants' Association has compiled a table from the census reports of 1904 and 1914, showing the changes in various lines of business in New York City brought about in ten years. This does not make a very favorable showing for the marble and stone trades. The number of establishments in these two industries reported in 1904 was 168; with 258 in 1914. The average number of wage earners in 1904 was 4,765; while in 1914 it was 3,15. The wages paid in 1904 amounted to \$4,384,000, and in 1914 the wages were \$3,031,000. The cost of materials was \$4,474,000 in 1904, and \$3,522,000 in 1914. The total value of products was \$11,915,000 in 1904, and \$9,456,000 in 1914. The only conclusion to be drawn from these figures is that a considerable proportion of New York's stone trade has been diverted to other centers.

### The Proposed Demurrage Rates

Stone men throughout the country are vitally interested in the new car demurrage tariffs filed by the Trunk Lines and effective December 1st, 1916. This tariff raises the car demurrage rate to \$2 for the first day after the free time, \$3 for the second day, \$4 for the third day, and \$5 for the days thereafter, and abolishes any allowance for weather interference. These rates are revolutionary. They are, in effect, since car demurrage is a part of the transportation rate, an increase from 100% to 400% in the rate. This will fall heavily on dealers handling such heavy commodities as stone. The Interstate Commerce Commission will, on proper application, if in its judgment the protest has weight, suspend the application of a tariff until a hearing is held, after which it will either allow the tariff to go into effect, modify it, or suspend it indefinitely, as it may determine.

The National Retail Monument Dealers' Association

of America has already filed a protest with the Interstate Commerce Commission and this protest, taken in conjunction with many others that have been filed, will bring the whole subject up for review. It will then be the task of shippers to show that such a regulation as this will work a hardship to almost every line of business.

No one will dispute the fact that the railroads of the country are called upon to face one of the greatest problems in their history. Never before has there been such a tremendous freight traffic, and it came almost without warning, as a result of the European War. The railroads were unable to prepare for this by the necessary increase in equipment. Still, as is too often the case, the railroads seek to pass the trouble along to the shippers. There is a lack of adequate switching facilities at most of the great terminals. Freight may be held up for an unconscionable time enroute, but when it is finally delivered the railroads expect the receivers to unload it with record speed.

Aside from this, many of the smaller railroads have a comfortable way of taking tribute from their great rivals. They divert freight cars from other lines for their own local traffic. No one will dispute the fact that the country is suffering at this time from a very manifest car shortage and this affects producer and the ultimate consumer alike. Car equipment cannot be made overnight and something must be done to secure more adequate transportation facilities. At the same time we believe there must be a better way of surmounting the difficulty than by fixing such exorbitant demurrage fines. Thousands of freight cars stand empty and idle for days and a better system of car accounting would serve to bring these sooner into service again. The great firms who are making millions of dollars by furnishing munitions of war can stand such a tax as this, but the ordinary manufacturer and merchant are doing business on a small margin of profit and an unforeseen tax like this will have a crushing effect.

#### Utilization of Marble Waste

The utilization of waste, that ever-important subject to the people of the United States, is being strongly urged upon marble quarrymen throughout the country by experts of the Bureau of Mines. Officials of the bureau have just recently completed a most interesting study of marble quarrying in this country, and as a result of their long investigations have given the marble men some very interesting things to think about, not the least of which is the utilization of their waste and the whole waste problem, says an exchange.

The stone resources of the United States, although great, are by no means inexhaustible, especially the finer grade of marble. In giving their ideas to the marble men the experts of the bureau point out that aside from the value of the rock, much of which has

always been wasted, the waste material incumbers the ground and interferes with their yard operations. The failure of some quarry companies, the officials think, is due to the quarrying of excessive amounts of material that remain unutilized.

As in every other business, the problem of waste in the marble-quarrying business is twofold. In the first place it has to do with all types of improved equipment and modern methods of excavation which tend to keep the proportion of waste at a minimum; and in the second place it must deal with the various uses to which waste material may be applied. In other words, it is a problem, first, of waste elimination, and second, of the utilization of whatever waste is unavoidable.

Although the proportion of waste may be kept at a minimum by the adoption of economical quarry methods and efficient machinery, there is always, it has been found, more or less unavoidable waste. Many manufacturers in various lines of industry have found that the manufacture and sale of by-products from otherwise waste materials have placed their industries on a profitable basis. Bureau experts say that tremendous heaps of waste material found near many marble quarries testify to the need of greater development along the line of waste utilization as well as waste avoidance.

#### Slate and Artificial Substitutes

The slate trade in Great Britain is naturally almost dead at this time, as a result of war conditions. A correspondent of the *Slate Trade Gazette* suggests that the quarries would find it to their advantage to push square slates in the same way as asbestos slates, say, 10x10", 12x12", 14x14". Artificial slates are not being imported to any extent now, and natural slates used in the same way are not much heavier. A firm quoted asbestos at about \$12.25 per square for the town of "X," in July last, and corrugated iron a little less. The correspondent says that he did the work with 22"x11" Welsh slates a trifle under. He thinks "if the quarries would wake up, something could be done to knock out foreign substitutes." One can only hope that the Welsh slate producers are more ready to absorb progressive ideas than the American.

#### The Carrere Memorial

The memorial to the late John M. Carrere, the famous New York architect, has just been completed in this city. The memorial takes the form of an exedra and staircase leading from the level of Riverside Drive and Ninety-eighth Street to the park between the Drive and the river. The memorial was designed by Thomas Hastings, of Carrere & Hastings, and is built of pink Milford granite with platforms and steps of bluestone. The delays in the building of this memorial have been occasioned by the question of location and scheme.



It was first decided to place the Memorial at Riverside Drive and Ninety-second Street, but it was found that the Joan of Arc Monument had been located at Ninety-third Street and Riverside Drive, and it was thought the two monuments would be too close together.

### New Companies

The Rhode Island Pink Granite Company, of Westerly, R. I., to quarry and deal in granite. Capital, \$10,000. Incorporators: Isaac C. Ellis, Samuel H. Davis, and Genevieve Burdick, all of Westerly.

The Ohio Granite Company, of Elyria, Ohio, to manufacture and sell granite. Capital, \$10,000. Incorporators: W. P. Bates, E. L. Smith, R. H. Smith, Johann Petersohn, W. B. Johnston.

Blue Grass Quarries Company, of Huntington, W. Va., chief works at Freestone, Rowan County, Ky., to quarry and sell stone. Capital, \$25,000. Incorporators: B. B. Burns, W. N. Offut, C. S. Brown, C. N. Brown, and H. K. Eustler, all of Huntington.

United Black Granite Company of America, of Wilmington, Del., to quarry and manufacture granite. Capital, \$1,000,000.

The Kokomo Stone Quarry Company, of Kokomo, Ind., to quarry and deal in stone. Capital, \$130,000. Directors: N. M. Bitters, Grant A. Waller, Rufus Danner.

Tanksley-Drumright Cut Stone Company, of Nashville, manufacture and deal in marble, tile, etc. Capital, \$25,000. Incorporators: A. C. Tanksley, J. H. Drumright, Cecil S. S. Lewis Malone.

Ballard Tile & Marble Company, of Sioux Falls, S. D., to manufacture and deal in marble, tile, etc. Capital, \$25,000. Incorporators: L. W. Ballard, H. A. Sayre and J. A. Michel-son.

The American Tile & Marble Co., of Minneapolis, to manufacture and deal in marble, tile, etc. Capital, \$50,000. Officers: C. A. Bloomquist, as president; O. A. Lester, vice-president; John K. Jolaas, secretary, and C. E. Englund, treasurer.

The LeRoy Lime & Crushed Stone Co., Inc., of LeRoy, N. Y., to conduct a general quarry business. Capital, \$50,000. Incorporators: J. L. Heimlech, W. G. Heimlech, W. G. Heimlech, LeRoy.

The Peeksville Granite Company, Inc., to quarry and sell granite, etc. Capital, \$50,000. Incorporators: A and F. J. Gregory, S. J. Rosenfeld, West 103rd Street, New York.

The New Jersey Gravel Company, of Atlantic City, to deal in gravel, stone, etc. Capital, \$125,000. Incorporators: George S. Bennett, Richard E. Wheeler, Edgar Dreher, Irvington.

The Trent River Marble & Lime Co., of Pollocksville, N. C., to develop marble and limestone property. Capital, \$125,000.

The Wolverine Stone Company, of Detroit, Mich., to manufacture and deal in stone. Capital, \$50,000. Incorporators: Albert A. Albrecht, William B. Gregory, William A. Hubbard.

The B. A. Ness Company, Inc., of the Bronx, N. Y., to conduct a quarry and construction business. Capital, \$15,000. Incorporators: G. C. Harms, A. N. Ascosi, B. A. Ness, Mamaroneck.

### Receiver's Sale of a Marble Property

On July 8th, 1915, H. G. Siegfried and A. E. Carr were appointed receivers of the Henry A. Schweyer Company, quarrymen and manufacturers of "Sylvan" Green marble, at Easton, Pa. With the contracts then on hand and the con-

tracts secured and completed since that time the receivers made some money but were limited in their work on account of not having the proper machinery for manufacturing the marble. The receivers found that to continue business and make it profitable it would be necessary to make extensive repairs to the old and install some new machinery for quarrying and manufacturing, and in addition about \$50,000 of capital was required to finance business, which the banks did not wish to furnish. For these reasons, in pursuance of an order from the court, the receivers will sell at auction on December 12 next the quarry and plant of the company at Fourteenth and Lehigh streets, Easton, Pa. This consists of a thirty years' lease on approximately fifteen acres of land with quarry rights, a quarry equipment, blacksmith shop, boiler house and a factory with necessary machinery for sawing and finishing marble, together with machinery and stock of marble, fixtures, accounts receivable, etc. An upset price of \$25,000 has been placed on the property.

### Government Work

Bids will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., for the construction of the following postoffice buildings: Until December 22, at Dowagiac, Mich., and Bakersfield, Cal.; until December 26th, at Mount Carmel, Ill., Maquoketa, Iowa, and Frederick, Md.; until December 27th, at Lacomia, N. H., and until January 18, 1917, at Marion, S. C.

Bids will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until December 27, for the extension and remodeling of the postoffice and courthouse at Oklahoma City, Okla.

A man in Canada is in the market for stone cutters' tools, etc., for monument and grave stone work. Address, Bureau of Labor, Washington, D. C., No. 22,942.

Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, until December 26th, for furnishing and installing one 80-ton bridge crane, three 15-ton bridge cranes, 12 five-ton wall cranes and 8 three-ton cranes, more or less, in each of the new structural shops at the Navy Yard, Norfolk, Va., and Philadelphia, Pa.

### Business Embarrassments

The New England Marble & Moasic Company, of Boston, Carlo Alessi and Scipione Ratti, proprietors, have filed a petition in bankruptcy, with liabilities of \$12,388 and assets of \$735.

George Loeb, Jr., a marble and tile dealer, of Water and John streets, Cincinnati, Ohio, has filed a petition in bankruptcy and Charles Sawyer has been named as receiver. The liabilities are given as \$3,100 and the assets as \$1,000.

Parker E. Lary has been named as receiver of the Indiana-Bedford Stone Company, with plant at Bedford, Ind.

According to reports in the Denver newspapers, Colorado business men may become controlling factors in the Colorado-Yule Marble Co., under a reorganization now in process under the receivership of J. F. Manning. A large stockholder said that local interests have expressed a willingness to assist in putting the company on a solid basis and raising \$553,800 of new money for that purpose.

An order has been filed in the courts of Troy, discharging Paul Blake, as receiver, for the Rensselaer Stone Company, in an action brought against that company by the Hudson River Trust Company, the business for which the receivership was created having been closed.

Frank Woodward has been appointed receiver for the business and assets of George Ross, marble dealer, 322 West Court Street, Cincinnati, Ohio.



## A Dome in Stonework

A DOME or cupola may be generally described as a convex roof or vault, either hemispherical or of any other curve, raised over a circular elliptical or polygonal area.

The oldest example in existence is that over the Pantheon at Rome, erected under the Emperor Augustus (born 63 B.C., died A.D. 14), and still perfect. It is hemispherical in form, with an internal diameter of 142 feet, and a height of 143 feet from the floor to the summit. Its soffit is lightened in appearance by a series of coffered panels.

This dome may be taken as one of the earliest masonry structures of the kind in Europe that embraces fully the constructive principles of the arch, by covering a large circular area with a hollow shell of cut stone. The design and construction of a stone dome on so large a scale, capable of resisting as this has done the effects of time and climate for centuries, constitute one of the greatest triumphs of architectural art and masonic skill, says a writer in the *Building World*.

The custom of erecting domes over cathedrals, churches and other buildings became prevalent during the period in which Italian architecture had sway over a large portion of Europe. The great masterpiece of the modern Italian style of vaulting is the dome of St. Peter's at Rome, which is 139 feet in diameter, and was built at the close of the sixteenth century, from the design and instructions left for that purpose by Michael Angelo.

According to Dobson, this dome exhibits an advanced knowledge of the application of stone cutting, being executed of regular masonry; whilst the earlier domes and cupolas were generally built of bricks, pumicestone, earthenware, etc. On the other hand, Professor Donaldson, a great authority on the subject, states that "there is not, strictly speaking, a real stone dome deserving the name in Europe, except that of the Pantheon in Paris, which is constructed of regular coursed masonry, whereas that of St. Peter's at Rome was constructed on the ribbed principle and filled in between with a species of concrete."

There is an apparent contradiction here which, however, does not much affect the problem about to be discussed. This shows a design for a dome constructed in regular courses of masonry, the principles of which may be applied or extended to similar domes of any magnitude.

In a spheroidal dome with an aperture at the apex or top, the bed joints are conical surfaces, and terminate on the extrados and intrados in horizontal circles. The vertical joints are contained within a plane which intersects with the axis of the dome.

Fig. 1 represents a half plan of the dome, the left-hand portion showing a quarter of the plan looking down, and the right-hand portion a quarter of the plan looking up. Fig. 2 shows half of the dome in elevation and section, the left-hand portion being a quarter of the elevation, and the right-hand portion being a quarter of the section. The dotted diagonal lines in Fig. 2 show the bonding of the stones in the several courses.

For making the moulds and templates and working the blocks, it is only necessary to set out full size a quarter of the dome, the remainder being repetition. Begin by setting out the plan (Fig. 1) with centre lines *ACA* and *CD*. With *c* as centre, describe the semi-circle, giving the extreme boundary of the exterior surface or extrados of the dome, and also the line giving the boundary of the interior surface or intrados of the dome, and complete the plan, showing ribs, panels, etc., as designed.

Project lines *AB* from plan (Fig. 1) on to springing line (Fig. 2), and with *E* and *F* as centres set up the elevation and

section of the dome, divide the section into any convenient number of equal parts consistently with the size of the stones to be worked (in this example the number is seven—as 1 *A*, 2 *A*, 3 *A*, 4 *A*, 5 *A*, 6 *A*, 7 *A*), and draw radiating lines from centre *F* to *b*, *c*, *d*, *e*, *f*, *g*, giving the joints which are normals to the extrados. Although these joints are not normals to the intrados, yet the difference is very slight.

Perhaps the best way in an example of this kind, where the dome tapers, is to take an intermediate line central between the intrados and extrados, and draw the joint lines from this centre; this would then equalize the difference and be as nearly correct as possible. Project *b*, *c*, *d*, *e*, etc. (Fig. 2), on to plan (Fig. 1), and with *c* as centre describe quadrants *b*, *c*, *d*, *e*, etc. The plan of the arris of horizontal bed joints on the interior surface is thus obtained. For the vertical joints each course will consist of an equal number of stones (except the top course), breaking joint over each other and diminishing in size from the bottom to the top course. These are set out on the plan.

The stones hatched in on the plan (Fig. 1) show the projection of one voussoir in each course, as 1 *a*, 2 *a*, 3 *a*, 4 *a*, 5 *a*, 6 *a*, and 7 *a*. In each course one of the voussoirs is moulded and one plain. These being similar and alike in situation, one bed mould and one joint mould to each stone will be sufficient for working.

For working the voussoirs, the method here adopted is not, perhaps, the most economical as regards the material, but it is comprehensible, and secures truer form than would a complication of moulds and bevells; whilst the extra value in material is more than counterbalanced in the lessened labor of working. No. 2 stone is selected as an example for showing the method of working, which is common to all the others. The rough block required for working these stones by this method is rectangular and of the extreme length of the bed mould (Fig. 3) as shown by the rectangle which circumscribes it, the height being that of the joint mould (Fig. 4); and secondly, the shape of the block is that of a segment of a hollow cylinder as shown by Fig. 5, which contains the finished block, the arrises only touching the boundaries of the cylinder, as shown by Fig. 6.

Fig. 3 shows the bed mould comprising the top and bottom bed. Fig. 4 shows the section or joint mould. Begin by working a surface of operation as *ab* (Fig. 4), and *cd* parallel to it. Labor need not be thrown away on these surfaces, as the arris *cc* on the top bed and *bb* on the bottom bed are all that are required to be kept true and fair; the other portion may be roughly chiselled off, and at the same time kept straight.

Scribe in the bed mould (Fig. 3) on both beds, as *AD*, *AD* (boning or sighting them in), and work the joints *AD* square. Scribe in the joint or section mould (Fig. 4) as *AB*, *CD* to each joint. With the template cut to *DD* (Fig. 3) work a horizontal draft, and draw a line parallel to *d* at *d*, giving the arris of the joint and the concave surface.

With the template cut to *cc*, scribe in the line on the top bed giving the arris line of the top joint and of the convex surface. Work off the splay joint *cd* to the lines thus given, forming the top conical bed. On the bottom bed, with the template cut to *bb*, scribe in the line giving the arris of the bottom joint and concave surface.

With the template cut to *AA* at *A* work the horizontal draft, and draw a line parallel to *a* at *A*, giving the arris of the bottom joint and of the convex surface. Work off the splay joint to the lines given, thus forming the bottom conical bed; next work the inside concave surface or soffit, using templates

made from  $\mathfrak{B}$   $\mathfrak{D}$ , and lastly, the outside convex surface, using templates and reverses for guidance.

Fig. 7 illustrates the finished stone. The stones in the other courses of the dome are worked similarly.

There is some difference of opinion as to the best method of working the voussoirs in a dome, with respect to waste of material and labor. Perhaps for the first two or three courses no better method can be followed than the one just described, which is simple and gives the best results, whilst after working the stones are truer in form than they would be by using a number of bevels.

Another method, however, which saves much material and labor, although it demands much greater care in the execution, is here shown. Fig. 8 shows the bed mould of the voussoir ( $\mathfrak{C}$   $\mathfrak{D}$ ,  $\mathfrak{C}$   $\mathfrak{D}$ ) in the fourth course of the dome (4A). This is one of the courses in which there is much waste by the previous method of working, as shown by the dotted lines  $a$   $b$   $c$   $e$  (Fig. 9).

Fig. 9 shows the section  $A$   $B$   $C$   $D$ , the rectangular line  $A$   $B$   $f$   $e$   $g$  circumscribing the mould and giving the size of stone required. When this line is compared with the dotted line  $a$   $b$   $c$   $e$ , the difference in size is at once seen. Careful judgment will be required to select a stone sufficiently large, so that all the surfaces and arrises are contained within its boundaries.

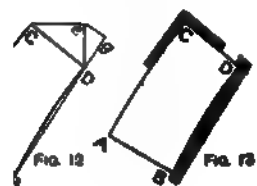
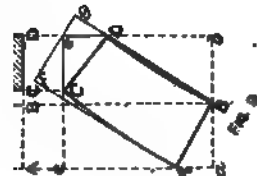
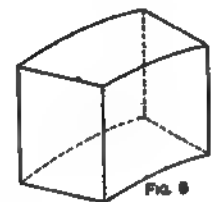
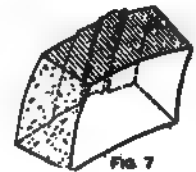
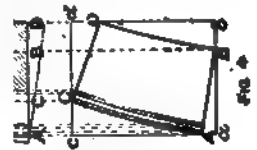
Begin by working a plain surface of operation as  $c$   $e$  (Fig. 10) and apply the bed mould (Fig. 8) and scribe in as  $c$   $c$  and  $\mathfrak{D}$   $\mathfrak{D}$ . Work joints  $c$   $\mathfrak{D}$  square with the bed; these joints

require careful working, a portion of the joint extending to  $A$  (Fig. 9) being outside the line of square; but the one portion of the joint having been worked, the other portion is obtained by means of boning in with the straightedge. Apply the joint mould to each joint, as  $A$   $B$ ,  $C$   $\mathfrak{D}$  and scribe in.

Fig. 11 shows the next operation, that of working the convex spherical surface  $c$   $A$  by the guidance of a bevel; the stock of bevel being applied in the direction of a line radiating from center  $c$  on plan (Fig. 1). These lines are usually marked on the mould and transferred to the stone. Fig. 12 shows the third operation, that of drawing the line  $A$  parallel to  $c$ . A bevel is used, giving the bottom splayed bed  $A$   $\mathfrak{B}$ , which is worked off.

Fig. 13 shows the fourth and last operation, that of cutting away the angular portion  $c$   $e$   $g$   $\mathfrak{D}$  for the splay joint  $c$   $\mathfrak{D}$ , using the bevel as shown. The concave spherical surface is worked by the aid of a template made from  $\mathfrak{B}$   $\mathfrak{D}$ , thus finishing the stone. It will be observed that by this method the accuracy of the work depends almost entirely on the first plane surface of operation; and should any errors occur in applying the bevels from this bed, the stone will not be of the shape and form intended.

The danger of using bevels is that, should there be the least deviation from the actual position in applying the bevel, the stone would not be true. This would not be of so much consequence were the stone an isolated block, but where the stone is surrounded by others, the blocks forming spherical



surfaces meeting and touching each other, the matter is of the utmost importance. Figs. 3 to 13 are drawn to a larger scale than Figs. 1 and 2.

### Notes from the Stone Fields

#### MARBLE AND GRANITE

There is considerable indignation among the granite workers and quarry masters in Cornwall, England, because a contract for governmental dock work has been placed with a Norwegian firm. The amount involved in this transaction is comparatively small, only about \$15,000, but it is claimed that fully half of this would be expended for labor at a time when the English quarry industry needs all of the help it can get.

David L. Williams will open a marble yard at Marcelino, Mo.

McKee & Carr, of Rushville, Ill., have dissolved partnership

#### WILDERHOPE HALL, SCOTLAND

An ancient stone structure, from a sketch by C. E. Bateman, in the *London Architect and Contract Reporter*

and Mr. G. E. Carr has taken over the interests of Mr. McKee, and will engage in the marble and granite business at Rushville with his son, under the firm name of Carr & Carr.

C. C. DeLon has purchased the interest of S. J. Ferguson in the Ferguson & DeLon Granite Company at Kokomo, Ind., and will hereafter conduct the business under the name of the DeLon Granite Company.

The Lafayette Granite Company, of Lafayette, Ind., will erect a two-story brick building, 40 by 100 feet, in order to accommodate their increased business.

J. A. Stoves has taken over the interest of J. F. Gonella in the Florence Marble Works at Florence, Ala., and will hereafter conduct the business.

J. R. Elliott has retired from the Sheldon Marble Works at Sheldon, Iowa, and the business will hereafter be conducted by W. C. Hagy, W. S. Bray and C. V. Miller.

Charles G. Blake & Co., marble and granite dealers, whose plant at 77th Street and Ellis Avenue was burned down a few months ago, are building a new shed, 45 by 125 feet.

A white marble memorial tablet in memory of Alfred Gwynne Vanderbilt, who lost his life on the steamship *Lusitania*, has been erected by his mother in Trinity Church, Newport, R. I.

A memorial tablet to the late William Kemp, at one time mayor of Troy, N. Y., and for forty-nine years a vestryman of Christ Episcopal Church in that city, has just been placed in the church. It is of Siena marble and bronze.

John Clark has taken over his partner's interest in the firm of Clark & McCormack, owners of the granite quarry and manufacture plant at Rockville, Minn. The stone from

this quarry was used in the construction of the St. Paul Cathedral.

The Taintor Granite Company, of Augusta, Me., have recently sold the two electric traveling cranes installed some years ago in their plant at Hallowell.

The new jewelry store of J. E. Caldwell & Co., in the Widener Building at Philadelphia, has just been completed. This is elaborately finished in Levanto, Briotte de Rance and Cream Alabama marble, and Tavertine stone.

The Mount Nebo Marble Company, of Salt Lake City, has just been given a contract by that city for marble rest benches to be placed at convenient locations on the leading thoroughfare.

An attempt was made by burglars to dynamite the safe of the Carthage Marble and Limestone Co., in their office at 3900 Chouteau Avenue, St. Louis, Mo. The safe was badly wrecked but nothing was secured.

A mausoleum in the classic style has been erected by the Presbrey-Coykendall Co., of New York, in the Forest Hill Cemetery at Utica, for the Capron family. It is built of Barre granite, with the interior finish of white marble.

The Wisconsin Granite Company, with main office at 1503 Lumber Exchange, Chicago, has just increased its capital stock from \$200,000 to \$1,000,000. The company has completed the construction of its plant at Utley, Wis., and the plant now has a capacity of 350 yards and does mostly fine sizes of crushed granite. The company is about to begin rebuilding its crushed plant at Waupaca, Wis., destroyed by fire a year ago. This will be ready for spring business and its capacity will be 250 yards of crushed granite a day. Two new electric derricks and another 1,000-foot compressor have been added to the company's plant at Red Granite, Wis., in the past few months.

C. N. Clark & Co., long engaged in the marble and granite business in Urbana, Ill., have just opened a branch office at Champaign, Ill.

The walls of the new granite building of the State Street M. E. Sunday School at Camden, N. J., have been completed and it is expected that the structure will be finished shortly.

There is a controversy in Boston over the disposition of the eight granite columns taken from the custom house when that building was remodeled, and presented to the city. The City Planning Board recommend that they be stored until an opportunity is presented for their use. As this would cost about \$1,500, the mayor wants the park department to use them at once on the roadway leading to the Aquarium in South Boston.

The Drew Granite Company, has rented for three years, with an option to buy at the end of that period, the Sutherland shed at Waterbury, Vt., which has been closed since the W. C. Carr business went into the hands of a receiver. The company will install a Parker Rotary Stone Saw and will operate its two plants to the utmost capacity.

The City of Cincinnati, Ohio, has made a series of successful experiments in paving its streets with old granite blocks which were recut to small size and grouted and flushed with bitumen.

The Marathon Granite Company has completed a new addition to its plant at Warsaw, Wis. The building is 42 by 160 feet. In the spring 200 feet more is to be added to the building.

The Wise Granite Company, of Richmond, Va., has been awarded the contract for the erection of the new professional building to be erected at Fifth and Franklin streets, in that city. The amount of the contract is about \$165,000. The building was designed by Charles M. Robinson and will be used almost exclusively by professional men, principally doctors.

Gronenberg & Leuchtag have completed plans for a five-

story apartment house at 34 Monroe Place, Brooklyn, N. Y., to be built of white Vermont marble and tapestry brick.

The Southern Granite Company is a concern which has just been formed to take over the old plant of the Southern Granite & Marble Co., at Spartanburg, S. C. The plant will be reconstructed and the company will do a general cut stone business.

The Schoone Tile & Marble Co., of Grand Rapids, has been awarded the contract for the marble work in the West of the Intermediate School, Jackson, Mich.

C. W. Brannen, formerly with the Capital Monument Company, Columbia, S. C., and C. M. Thompson, formerly of the McNeill Marble Company, of Marietta, Ga., will establish a marble business in Savannah, Ga.

The Swedish Lutheran Society, of Brockton, Mass., will erect a new granite church in the English Gothic style of architecture.

There is continual activity in the new green marble center at Ishpeming, Mich. The Michigan Verde Antique Company are lifting blocks from the latest cut, and the quality of the marble is said to exceed expectations. The company will soon begin the removal to its quarry of the First-New mill at Marquette. At the Marquette Green Marble Company's location several dwelling houses are about ready, and machinery is being gotten in. The railroad will soon be commenced and its completion will mark the beginning of active operations in preparing for the quarrying.

The city of Barre bonded itself for \$14,500 for a granite arch bridge, and called for bids for the structure. The lowest bid received was \$34,348, and now the specifications are being modified. It would seem as if Barre, of all cities in the country, could make a closer guess than this.

#### LIMESTONE AND SANDSTONE

It is announced from Washington that the new Government Building at Birmingham, Ala., will be constructed of limestone. Bids have been asked and it is thought that the contract will be let in a short time. There was an appropriation of \$1,000,000 for the purchase of a site and construction of the building. Bids were called for a marble structure, but they were all in excess of the sum available and were therefore rejected.

The State limestone-crushing plant at Waynesboro, Mis., is almost completed and it is expected that work will begin shortly after the first of the year. The plant will supply limestone to farmers at cost. The work will be done by State convict labor.

Colorado sandstone blocks that have given 30 years of service on the streets of Topeka, Kan., are now being used as the foundation for a new paving. The blocks are laid on cinders as for a regular pavement and are grouted.

The new branch of the Baltimore & Ohio Railroad to the plant of the Security Lime & Cement Co., at Security, Md., has been opened. The plant was started in 1908 on a very small scale, but today it has an output of 1,000,000 barrels yearly.

Bing & Bing are erecting a thirteen-story apartment house at Park Avenue and 55th Street, New York, after the plans by Emery Roth. The style of the building is that of the Italian Renaissance and the façade will be of limestone throughout.

The South Street M. E. Church of Utica, N. Y., is about to erect a new edifice, and preliminary to the adoption of plans, the building committee paid a visit of inspection to the Methodist Church at Waverly, N. Y. It was decided to follow the general lines of the latter structure. The Waverly church was erected a year ago at a cost of \$66,000, and is of Hummelstown brownstone.

The Vermont Marble & Cement Company, of which C. L.

Byron, of Seattle, Wash., is president, holds the rights to 100 acres of land in Snohomish County, Wash., that are estimated to have deposits of 26,000,000 tons of limestone suitable for the manufacture of Portland cement.

#### Construction Notes

The Corn Exchange Bank has leased the premises No. 12 West 28th Street, New York, for 21 years, to be occupied as a branch of the banking business. The owner will improve the property with a marble building, after designs by S. Edson Gage.

The trustees of the American Museum of Natural History, New York, have planned the erection of a southeast wing and court building at an estimated cost of \$1,000,000. The city is under contract to provide suitable housing for this institution, but as an appropriation would be delayed because of the tremendous budget of the city, the trustees are likely to raise the necessary money themselves. The building is of granite.

The Quaker Ridge Field and Country Club will erect a club house near New Rochelle, N. Y., where the club has taken title to 120 acres. The building will be in the English

#### THE MINSTER AT VILLIGEN, GERMANY

A sketch of the old church from the southwest, by the late J. Tavenor Perry

style of architecture, of stone and timber, after plans by Henry G. Morse.

A \$1,000,000 sea-wall will be built alongside of Lake Ponchartrain between the West End, New Orleans, and Spanish Fort.

The contract for a new \$100,000 church to be built at New Orleans by the Napoleon Avenue Presbyterian congregation has been awarded to W. W. Van Meter of that city. The sub-contract for the limestone work has been awarded to W. Haley, and for the marble to A. Weiblen, both of New Orleans.

City Architect Christy, of New Orleans, has prepared plans for a \$300,000 building for the John Dibert Memorial Hospital.

The new church for St. Dominick Roman Catholic parish of Columbus, Ohio, has just been completed and dedicated. The new structure is built of Bedford limestone, with polished

granite columns. The architects of the building were J. T. Comes and J. Kruger, of Pittsburgh.

The contract for the interior stone and marble work in the new Hamilton County Court House at Columbus, Ohio, has been awarded to the Vermont Marble Company, of Proctor, Vt. The company is to complete the work within 275 days after being notified that the building is ready for the marble.

Plans are in progress for alterations and additions to the banking store and apartment building of the National Bank of Chester Valley at Coatesville, Pa. The architect is A. A. Ritcher, Reading, Pa. The work will cost about \$60,000.

Theodore Wells Pietsch, American building, Baltimore, has

The architects are Zantinger, Borie & Madera, 15th and Walnut streets, Philadelphia.

Bids will be received until December 27th for a \$60,000 school at Newton, Kan., after plans by Greenbaum & Hardy, Kansas City, Mo.

The Central Railroad of New Jersey has filed plans for a new passenger station on Broad Street, Newark, N. J., to cost \$483,000.

The Y. M. C. A., of Norristown, Pa., is planning the erection of a \$200,000 building.

Wabash College will erect a \$10,000 gymnasium at Crawfordsville, Ind., to cost \$75,000. The plans are by Herbert Foltz, Indianapolis.

C. R. Weatherhogg, Fort Wayne, Ind., is preparing plans for a \$300,000 building for the Y. M. C. A. of that city.

The University of Missouri is planning the erection of a \$250,000 student club house at Columbia, Mo.

The Elks of Spokane, Wash., expect to erect a lodge building, costing \$125,000.

State Architect C. H. Chandler, of Topeka, Kan., is preparing plans for remodeling the east wing of the State House at that city.

Bids will soon be received for the new \$1,000,000 two-story public library for Detroit, Mich., after plans by Cass Gilbert of New York.

St. Joseph's Seminary at Yonkers, N. Y., will build a philosophy hall, after plans by Robert J. Reilly, 470 Fifth Avenue, and F. H. Poole & Co., 13 West 30th Street, New York.

Bids will be received until December 18th for the construction of the senior public school at Syracuse, N. Y., to cost about \$150,000. The architect is James A. Randall, of Syracuse.

Messrs Russell & King, 602 Snow Building, Syracuse, N. Y., are preparing plans for a \$60,000 public school, at Onondaga Valley, N. Y.

All bids have been rejected for the new public school to be erected at Gloversville, N. Y., at an estimated cost of \$80,000. The architects are Messrs. Comstock & Van Dusen, of that city.

Bids will be received until December 15th, for the construction of the \$500,000 Lincoln high school at Jersey City, N. J. The architect is John F. Rowland, 98 Sip Avenue, Jersey City.

The Church of the Madonna at Fort Lee, N. J., will erect a three-story parochial school, after plans by James S. Pigott, Union Building, Newark.

Messrs. Duhring, Okie & Ziegler, 705 Bailey Building, Philadelphia, are preparing plans for a new church and Sunday school building, to cost about \$80,000, for the Olney Presbyterian Church, Olney, Pa.

Paul A. Davis, 713 Sansom Street, Philadelphia, has completed plans for a \$120,000 school for West Chester, Pa.

Baltimore County, Md., will erect a \$100,000 vocational school at Baltimore, after plans by Smith & May, Calvert Building, of that city.

The Roman Catholic congregation of Shawinigan Falls, Quebec, will erect a stone and brick church, costing \$150,000. The plans are by McDuff and Lemieux, 320 University Street, Montreal.

#### EARLY SIXTEENTH CENTURY STONE CHIMNEY

From an old English farm-house near Masham, Yorkshire.  
From the *London Architect and Contract Reporter*

prepared plans for a \$75,000 banking building for the People's National Bank of Laurel, Del.

Bids are being received for a \$100,000 banking and office building for the Lorain Street Savings Bank Company, of Cleveland. The architect is W. J. Carter.

Messrs. Schenck & Williams, architects, of Dayton, Ohio, have prepared plans for a \$250,000 ten-story banking and office building in that city for the Dayton Savings and Trust Company.

A \$500,000 building for the Federal Reserve Bank at Atlanta, Ga., is in contemplation.

Leonard Asheim, 211 State Street, Bridgeport, Conn., is preparing plans for a \$150,000 Public Welfare Building, of that city.

Marshall M. Shoemaker, 710 Broad Street, Newark, N. J., and County Architect Joseph B. Allen, of Irvington, N. J., are preparing plans for a ten-story Hall of Records, costing \$750,000, in connection with the Essex County Court House, at Newark.

Bids will be received until December 23rd for a two-story armory at Zanesville, Ohio. The architect is Fred W. Elliott, Chamber of Commerce Building, Columbus.

Lake Erie College will build a library and gymnasium, costing about \$120,000, at Painesville, Ohio. The architect is Abram Garfield, 915 Garfield Building, Cleveland.

Competitive sketches are wanted for a \$100,000 high school at Ashland, Ky.

Hastings, Neb., will build two public schools and a high school at a total cost of \$200,000. The architect has not yet been chosen.

Messrs. Johnson & Miller, of Terre Haute, Ind., are preparing plans for a \$150,000 grade school in that city.

St. Paul's Episcopal congregation of Chestnut Hill, Pa., will rebuild their church at an estimated cost of \$150,000.

#### Business Brevities

A large new crushing plant, erected by Bull & Wilbur, Inc., has just begun operations near Otisville, N. Y. The company owns forty-two acres of stone land located on the main line of the Erie Railroad, about two miles from Otisville. The crusher has a capacity of 800 tons a day and between twenty and fifty men will be employed. Dr. George R. Bull, of

Wurtsboro, is president of the company, and Leslie J. Wilbur, of Otisville, vice-president and general manager.

John McCauley, manager of a quarry at Millville, W. Va., died a few days ago as a result of injuries sustained in the quarry.

The Hamburg Quarry Company, of St. Louis, Mo., has increased its capital stock from \$2,000 to \$4,000.

Andrew D. Baird & Sons, Inc., formerly the well-known cut stone contractors of Wythe Avenue and Keap Street,

He had been in private practice as a geologist and mining engineer since 1904. For the past three years he had been field assistant to the California State Mining Bureau. He wrote many important geological works.

Eugene Sullivan, for many years a well-known granite manufacturer of Barre, Vt., died at his home in that city the past month. Mr. Sullivan was born in Ireland in 1849, but came to America in 1865 and settled in Westerly, where he learned the granite-cutting business. Thirty-five years ago he went to Barre, where he afterwards formed the firm of Eugene Sullivan & Son.

John C. Callahan, whose death at Gouverneur, N. Y., was announced last month, was one of the most widely-known marble men in the State. For the past three years he had leased and operated the St. Lawrence marble plant in Gouverneur. For eight years he was connected with the Gouverneur Marble Company, and later was the superintendent of the plants of the Watertown Marble Company in Gouverneur and Canton.

### Trade Notes

For the use of those who prefer manila rope to wire rope for light hoisting and hauling, the Ingersoll-Rand Company, No. 11 Broadway, New York, has brought out a new model Little Tugger Hoist which is designated No. 11. The square piston, reversible driving engine, automatic lubrication, enclosed gearing, drum release clutch and worm-operated band brake are essentially the same as in the No. 1 Model, which has been extensively used since its introduction about two years ago. The main differences are in the diameter and length of the drum, the width of the flanges and, necessarily, the main frame and over-all dimensions. The new No. 11 Little Tugger has a hoisting drum 7 inches in diameter by 17 inches long with 5-inch flanges. This accommodates 300 feet of  $\frac{3}{8}$ -inch manila rope. The maximum capacity of this hoist is conservatively rated at 600 pounds. The weight of the hoist itself is 358 pounds. It is  $21\frac{1}{2}$  inches long,  $31\frac{1}{4}$  inches wide and 23 inches high. Like the No. 1, the No. 11 Little Tugger is built for operation both by compressed air

#### INGERSOLL-RAND HOIST FOR MANILA ROPE

Brooklyn, send out an announcement to the trade that the corporation is in liquidation and that the plant has been rented to Andrew R. Baird, who will continue the business in his individual capacity.

The quarrying business at Sturgeon Bay, Wis., has closed for the season with the shipment of a bargeload of riprap stone to Manistique, Mich.

Fred Hirth, of Grand Rapids, Mich., has been awarded the contract for the cut stone work in the six-story business building being erected by Dr. Ranch, Lansing, Mich.

Members of the Granite Cutters' Union of San Francisco, together with a number of other citizens, have volunteered to clean up Mission Dolores Cemetery, one of the very old burial places. The stone cutters will repair tombstones and copings.

### Obituary Notes

Francis M. Nichols, founder of the firm of Nichols & Company, one of the oldest retail monument men in the country, died at his home in Chicago the past month, after a long illness, in his 82nd year. Mr. Nichols was born in Wayne County, New York, in 1834, but went to Chicago in his early forties. In 1868 with his brother, E. T. Nichols, the sculptor, he established *The Reporter*, a monthly journal devoted exclusively to the monumental industry and for a number of years the only magazine of its kind. Mr. Nichols had a very wide acquaintance in the trade and had done much to advance monumental art.

C. D. Billman, a marble and granite dealer, of Logansport, Ind., died suddenly during the past month.

Edwin W. Marble, for many years in the marble and granite business at Scowhegan, Me., is dead at the age of 79 years.

Frederick James Hamilton Merrill, who was State Geologist of New York from 1899 to 1904 and director of the scientific exhibit of New York State at the Chicago fair, died at Los Angeles, Cal., the past month. Mr. Merrill was born in New York in 1861 and educated at the Columbia School of Mines.

#### "LITTLE TUGGER" HOIST, No. 11

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